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Environmental Impact Assessment Guidelines for Selected New Source Industries

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ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES FOR SELECTED NEW SOURCE INDUSTRIES

U.S. ENVIRONMENTAL PROTECTION AGENCY
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To implement its responsibilities under the National Environmental Policy Act of 1969 and the Federal Water Pollution Control Act as amended, the Environmental Protection Agency requires all applicants for permits to discharge pollutants to submit an environmental questionnaire to be provided by EPA. The present guidelines are intended to aid applicants in preparing the environmental assessment.

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AUTHORITIES AND RESPONSIBILITIES

The National Environmental Policy Act of 1969 (NEPA), 16 U.S.C. 4321 et seq., implemented by Executive Order 11514 of March 5, 1970, and the Council on Environmental Quality's (CEQ's) Guidelines of August 1, 1973, requires that all agencies of the Federal Government prepare detailed environmental statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The objective of the Act is to build into the agency decisionmaking process an appropriate and careful consideration of all environmental aspects of proposed actions, explain potential environmental effects of proposed actions and their alternatives for public understanding, avoid or minimize adverse effects of proposed actions and restore or enhance environmental quality as much as possible.

Section 511(c)(1) of the Federal Water Pollution Control Act as amended (FWPCA) (P.L. 92-500) requires that NEPA apply to the issuance of a permit under 402 of FWPCA for the discharge of any pollutant by a new source as defined in 306 of FWPCA. The discharge of a pollutant, as defined in 502(12) of FWPCA, means an addition of any pollutant to navigable waters, the contiguous zone, or the ocean from any point source.

To implement its responsibilities under NEPA and the FWPCA, the EPA responsible official, who will be the appropriate Regional Administrator, will require all applicants for new source permits to complete an environmental questionnaire to be provided by EPA. In some cases, because of the significant impacts anticipated, the responsible official may also require the applicant to submit a more detailed written environmental assessment. These guidelines, supplemented by specific instructions from the responsible official when he determines such instructions are necessary, are intended to provide applicants with sufficient guidance to prepare the written environmental assessment.

The guidelines consist of a general guideline, providing assessment guidance on all industrial categories, and appendices providing more detailed guidance on specific industrial categories. Appendices are not available for all industrial categories. Consequently, the responsible official will have to provide, when an appendix has not been published, any detailed guidance that may be necessary on a case by case basis.

INTRODUCTION TO THE MANUAL

Guidance for preparing Environmental Impact Assessments (EIA's) for new source actions is provided in this manual in two major ways:

- A General Assessment Guideline, which discusses the general format to be incorporated in the EIA and the basic assessment considerations common to all industries.
- A set of Appendices to the General Assessment Guideline, which describe, on an industry-by-industry basis, the environmental problems representative of that industry, environmental controls employed by that industry, and other relevant information.

The Appendices are written to assist new source permit applicants in achieving otherwise difficult perspectives of environmental impact problems.

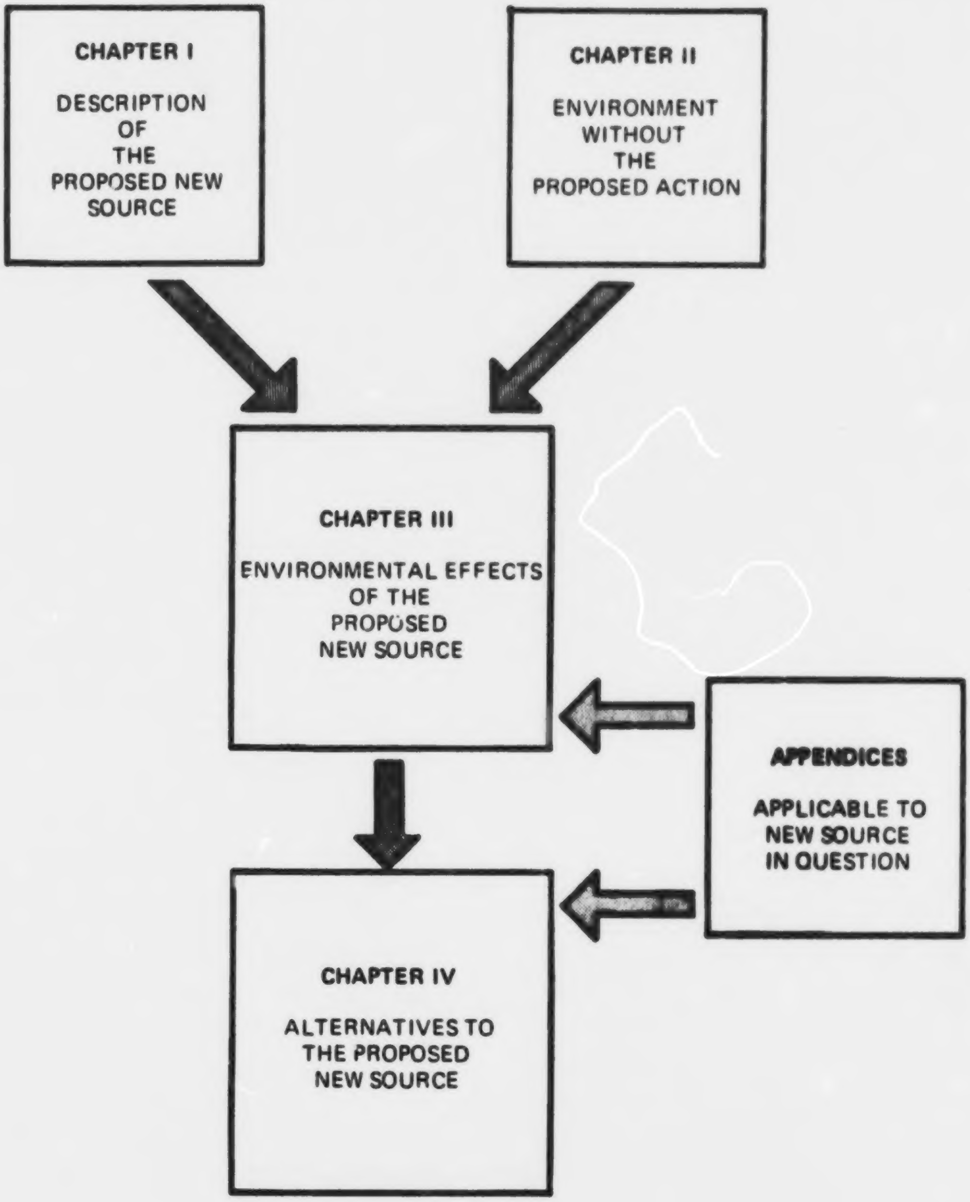
The General Assessment Guideline has been broken down into four major chapters. Each chapter describes a corresponding chapter which will be included in the EIA. These chapters are:

I Description of the Proposed New Source
II Environment Without the Proposed New Source
III Environmental Effects of the Proposed New Source
IV Alternatives to the Proposed New Source

Diagramatically, the interrelationship of these chapters and appendices is shown in Figure 1 .

FIGURE 1

INTERRELATIONSHIP OF CHAPTERS AND APPENDICES IN THIS MANUAL


CHAPTER I
DESCRIPTION OF THE PROPOSED NEW SOURCE
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ALTERNATIVES TO THE PROPOSED NEW SOURCE

CHAPTER I

DESCRIPTION OF THE PROPOSED NEW SOURCE

A. Overview

This Chapter of the EIA must provide a detailed explanation and description of the proposed new source and must present all information regarding discharges, emissions, and economic and other factors which will either directly or indirectly have an environmental impact.

The guidance which follows explains in more detail the specific content requirements for this Chapter, and is organized in a format which should be closely followed by the applicant in preparing the EIA.

B. Summary of Major New Source Features

A brief discussion of the purpose and background of the proposed new source should be presented.

The applicant should summarize in a short section the proposed new source in terms of its major component operations such as unloading, loading, raw material preparation, processing, storage, shipment, waste control measures, resource recovery measures, and others.

Such a summary should be supplemented diagramatically in a flow chart. Closely related operations, such as docking, transshipment and storage, must be shown as well.

C. Detailed Description of New Source

1. Description of Resource Requirements

Detail regarding requirements for raw materials, land, and energy should be provided. As an example of the types of resource utilization data which are required, the following list is provided:

a. Feed stock or process raw materials. Where such materials are in short supply, particular attention should be given to describing:

Source.
Availability.
Depletion rate.
Substitutes or replacements.
Competing uses.

b. Energy requirements should be described by:

Source.

Pollutants (discharges and emissions) which may be attributed to utilization of this source, excluding emissions or discharges attributable to commercial utilities which exist independently of the proposed new source.

Substitutes or backups.

Competing public or private uses for such primary sources.

c. Land uses (agriculture, industry, residential, etc.).

An aerial photograph or similar map showing the "study area" (site and surroundings) should be provided to aid such description. The study area should be described, both by map and by narrative in terms of drainage basin and of functional land and governmental jurisdiction units.

2. Description of the Process or Production Facility

a. Description of the major unit operations which comprise the process, together with a process flow diagram, must be given.

b. Approximate material balances of raw material, product, by-product, and wastes should be given. Peak capacity and proposed operating level should be defined.

c. Brief description of the normal process operation in relation to this diagram should be made. Air, water, and solid waste pollution sources should be discussed.

d. Description of intermittent process operations and their wastes should be made in relation to this process diagram. Examples of waste-generating intermittent operations are:

Start-up and shut-down.
Testing.
Decoking, etc.

Other intermittent sources specifically applicable to the proposed new source must also be described.

e. Projected date of start-up and operation.

3. Description of Economic Benefits and Product Markets

A description should be given of economic, social, environmental, or other benefits which will result from the proposed new source. Special attention should be given to define who or what will be benefited, and by how much. Assumptions or judgments inherent in such assessments should likewise be given.

CHAPTER II

ENVIRONMENT WITHOUT THE PROPOSED ACTION

A. Purpose

Description of the environment must be developed in this chapter, with sufficient detail and breadth so that all environmental impacts attributable to the proposed alternative may be explored.

B. Special Considerations

In preparing the description of the environment, it is important to keep several considerations in mind:

1. The need for a description which is broad enough to provide a meaningful basis for evaluating both direct and induced impacts (which may be social and economic, as well as environmental).

2. The need to incorporate a basic understanding of the interrelationships between social, economic, and environmental elements.

3. The need to incorporate a basic understanding of the chemical, physical, biological, and other properties of all process discharges that determine behavior and impact, in sufficient detail for the determination of impacts.

4. The need to describe the baseline environment as it exists at present, and as it would exist in the near-term future (10 to 15 years) if the proposed alternative were not implemented.

5. The importance of considering the effects of cumulative impacts. The proposed project must be weighed against not only its own set of impacts, but also against those additional impacts which will arise because of interaction with other environmental stresses which cumulatively cause much greater impact. For example, a stream of a given flow and gradient has a certain ability to assimilate degradable materials discharged to it, by virtue of its capacity to reaerate itself. If the stream course is altered by dams, channels, diversions, etc., this capacity is greatly altered, with a likely outcome of severe damage to stream ecosystems and man's ability to use it.

6. The need to provide sufficient detail to allow independent impact assessments by public reviewers and to minimize delays in EIA review.

C. Description of the Baseline

A description of major environmental, economic, and social elements which correctly characterize the project setting is necessary. The relative importance of each environmental element to the study area and the likelihood that it will be impacted more significantly than others should dictate the scope and depth of each description. While greatest emphasis should be placed upon environmental factors, adequate understanding and prediction of impact are not achievable without consideration of non-environmental features. The baseline environment should be described in terms both of its present characteristics and of those that would prevail in the next 10-15 years if the proposed new source were not implemented.

The following outline of important baseline elements should be followed by the applicant. It may be regarded as one recommended method of accounting for all baseline elements and organizing them in the EIA. The baseline elements encompassed in this outline will be in most cases a minimum requirement for all EIA's. The outline, when necessary, may be reorganized or supplemented by the responsible official.

1. Meteorology and Climatology

Description should be made in terms of features such as:

Temperature extremes and monthly averages.

Average annual rainfall.

Peak storm precipitation and frequency of occurence.

Hail, snow, hurricanes, and other unusual storms, along with their frequency and magnitude.

Wind rose (wind directions and wind speeds).

These data may be obtained in most cases from the U.S. Weather Service.

2. Air Quality

The ambient air quality must be established in terms of particulates, sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide, and photochemical oxidants.

Trends in air quality, in terms of specific pollutant concentrations, should be evaluated where data permit. Data insufficiencies should be described. (Anticipated air quality both with and without the proposed new source must be assessed in subsequent chapters. This assessment may require air diffusion modeling.)

Those pollutants which will be emitted from the proposed new source must be given special attention when describing ambient air quality. For large projects, data gaps for such pollutants may have to be supplemented by original air quality surveys.

Applicable State Air Quality Implementation Plans and any pending revisions should be identified and reviewed.

The responsible official should be consulted on Federal standards relating to indirect sources and significant air quality deterioration.

3. Topography

Description may be made with the aid of a U.S. Geological Survey Topographical map supplemented by aerial photographs. Major drainage basins, developments, transportation systems, and natural areas may be shown by overlay, outline, or verbal description. Descriptions of slope, erosion, and outcroppings are also required.

4. Geology

Description must be made of the geology of the study area. Geologic structures that have a direct influence on either groundwater or surface-water resources should be specifically described. Areas which are susceptible to earthquakes, landslides, subsidence, or other earth movement should be identified on an area map and described. Particular care should be taken to discuss geologic conditions in relation to proposed land disposal practices.

5. Soils

Identification of soil types in terms of depth to bedrock, permeability, erodibility, expansion, compaction, etc. should be made. A soils map should be provided.

6. Hydrology

a. General

The applicant should describe the relevant surface water bodies and ground-water aquifers in the study area.

b. Water Quality

The applicant should describe the existing surface- and ground-water quality, using physical, chemical, and biological parameters. If land disposal practices are proposed, special explanations of subsurface pollutant migration potentials shall be made.

c. Water Quantity

The applicant should describe the existing surface- and ground-water quantity and relate it to water uses in Subsection "6.e" below. The applicant should include a discussion of surface-water volume, stream flow rates, and the frequency and duration of seasonal variations, and should specify the 7-day, 10-year low-flow, ground-water storage volume, or extent and depth of the major aquifers, and their rate of recharge and/or depletion. Regulating (dams or locks) structures or diversion (dams, tunnels, or canals) structures which are in place, or proposed, should be identified. Structures influencing stream flow should be identified on an area map; the recharge areas for replenishing groundwater should also be identified on this map.

d. Water Quality and Quantity Problems

The applicant should identify existing and potential water quality and quantity problems in the study area, and should address specifically the relevant point and non-point sources of pollution, such as those arising from industry, municipalities, combined sewers, stormwater run-off, agriculture, silviculture, mines or mine drainage, salt-water intrusion, and subsurface pollution migration.

e. Water Uses

The type and extent of existing and future surface- and ground-water uses should be described. Reuse and/or reclamation of water should be considered. Regulatory and administrative procedures in force to reduce water consumption (thereby reducing waste volume) should be noted. Also, restrictions to protect sole-source aquifers, as promulgated under the provisions of Section 1424 of the Safe Drinking Water Act (PL 93-523), should also be considered in this review.

f. Water Quality Management

All pertinent areawide or basin water quality management plans, court-ordered allotments, or interstate compacts involving water quality/quantity in the study area should be summarized and related to the proposed new source. If State or local water pollution control agencies have issued permits or orders on specific water resources, these should also be identified and related.

g. Flood Hazards

The applicant should indicate the 25-, 50-, and 100-year flood levels for the study area where possible. Any Corps of Engineers flood-plain plan or proposed project should be indicated. The extent to which jurisdictional utilities within the study area are participating in the National Flood Insurance program being administered by the Department of Housing and Urban Development should be defined.

7. Biology

The applicant's description should include:

Major ecological systems of the study area (as determined by gross climatic, soil, and topographic features).

The location of unique natural communities (cranberry bogs, woodlands, tundra, etc.).

Migratory wildlife and habitat.

Wildlife benefits to man (recreation, food, aesthetics, and relative importance of each).

Rare or endangered plants and animals.

Species checklists are not a substitute for the foregoing information, and are generally discouraged. Information is generally available from State fish and game agencies, local schools and universities, and the U.S. Fish and Wildlife Service.

8. Land Uses

Local land use laws, ordinances, regulations, or other administrative instruments that may affect the project shall be described.

In cases where land use plans or other growth plans exist for the region being affected by the proposed new source, the EIA should carefully describe how the proposed new source conforms (or does not conform) to the plan. Maps showing planned land uses, such as residential, commercial, industrial, extractive, strip development, transportation, utilities, open space, conservation, agricultural, and historical uses should be provided. Such portrayal is necessary if the proposed new source impact upon the environment is to be assessed fairly, inasmuch as:

> The new source action may already conform to plans which were derived with full environmental consideration.
>
> The new source action may not conform to land use plans, and by virtue of its precedence, may greatly alter future environments through induced growth in ancillary industries.

The extent to which environmental impacts were considered in the development of land use plans should be described and critiqued.

Even where no land use planning has been done, the EIA must still reflect the anticipated land uses in ten to fifteen years without the proposed project.

Local and regional government agencies should be consulted to obtain the foregoing information.

In addition to discussion of land use plans, a description of development trends for industrial and other land uses should be given. The distinction between plans and trends must be made to account for potential non-conformance of recent or projected growth with intended land use plans.

9. Identification of Environmentally-Sensitive Areas

The applicant should describe and show on a map any of the following sensitive ecosystems which may be significantly impacted by the proposed action, and which are not described elsewhere in this chapter:

a. Surface waters.
b. Marshland, wetlands, and estuaries.
c. Flood plains or flood-retention areas.
d. Ground-water recharge areas.
e. Steeply sloping lands.

f. Forests and woodlands.
g. Prime agricultural lands.
h. Habitats of rare and endangered species.
i. Public outdoor recreation areas.
j. Sensitive geologic areas.
k. Archaeological and historic sites.

10. Population Projections and Economic Forecasts

The applicant should designate the current and projected population levels for ten to fifteen years (or more if available). In discussing these population trends, the rates of growth for the region, contained in reports for the Water Resources Council by the Bureau of Economic Analysis, Department of Commerce and the Economic Research Service, Department of Agriculture (the OBERS projections), should be considered. The reasons for using a particular projection of forecast should be stated briefly.

11. Other Programs in the Area

The applicant should describe local, State, and Federal projects (planned or underway) which have or which will have an impact (social, economic, or environmental) on the area. If there will be a major interaction between these projects and the proposed action, discuss the interaction.

CHAPTER III

ENVIRONMENTAL EFFECTS OF THE PROPOSED NEW SOURCE

A. General

All beneficial and detrimental effects or impacts of the proposed new source must be presented by the applicant in this chapter and discussed in detail.

Impacts will first be identified, evaluated, and described by analyzing each project requirement and operation. This information will then be aggregated using the same environmental elements employed in describing the baseline environment in Chapter II. The evaluation and description of the impacts (both prior to and after aggregation) shall include a specification of their magnitude, significance, and a number of other characteristics. The extent to which the proposed project will effect the ten to fifteen (10-15) year no-project baseline environmental forecast (Chapter II) will be explicitly discussed. The steps involved in preparing this chapter are shown graphically in Figure III-1. These steps are discussed in greater detail in the sections that follow.

B. Impact Identification

1. General

Diagramatically, the impact identification process may be illustrated as shown in Figure III-2.

This step analyzes each project requirement and operation, and weighs it against control technologies (such as waste treatment plants) and against environmental sensitivity. Impact identification is thus predicted by a good understanding of the environmental baseline, the proposed project, impact control technology, and the natural laws and principles governing their interaction.

As reflected in Figure III-2, impacts may be ameliorated or prevented by certain techniques or measures. The applicant is expected to state what controls are technically feasible for the proposed new source. Where ameliorative techniques exist but are not proposed, the applicant should specifically justify such decisions.

Not shown in Figure III-2 is the need to consider different project alternatives as a means for limiting environmental impacts. Alternatives which must be analyzed by the applicant are discussed in Chapter IV of these guidelines.

FIGURE III-1

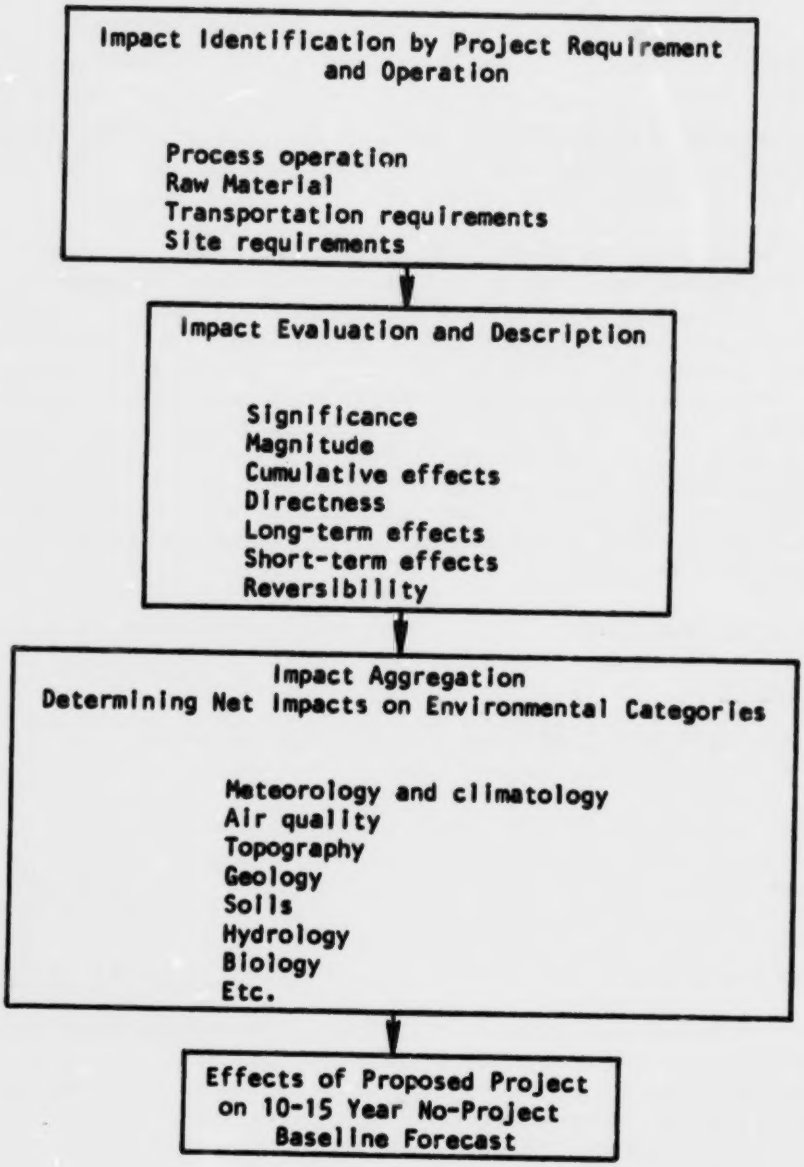
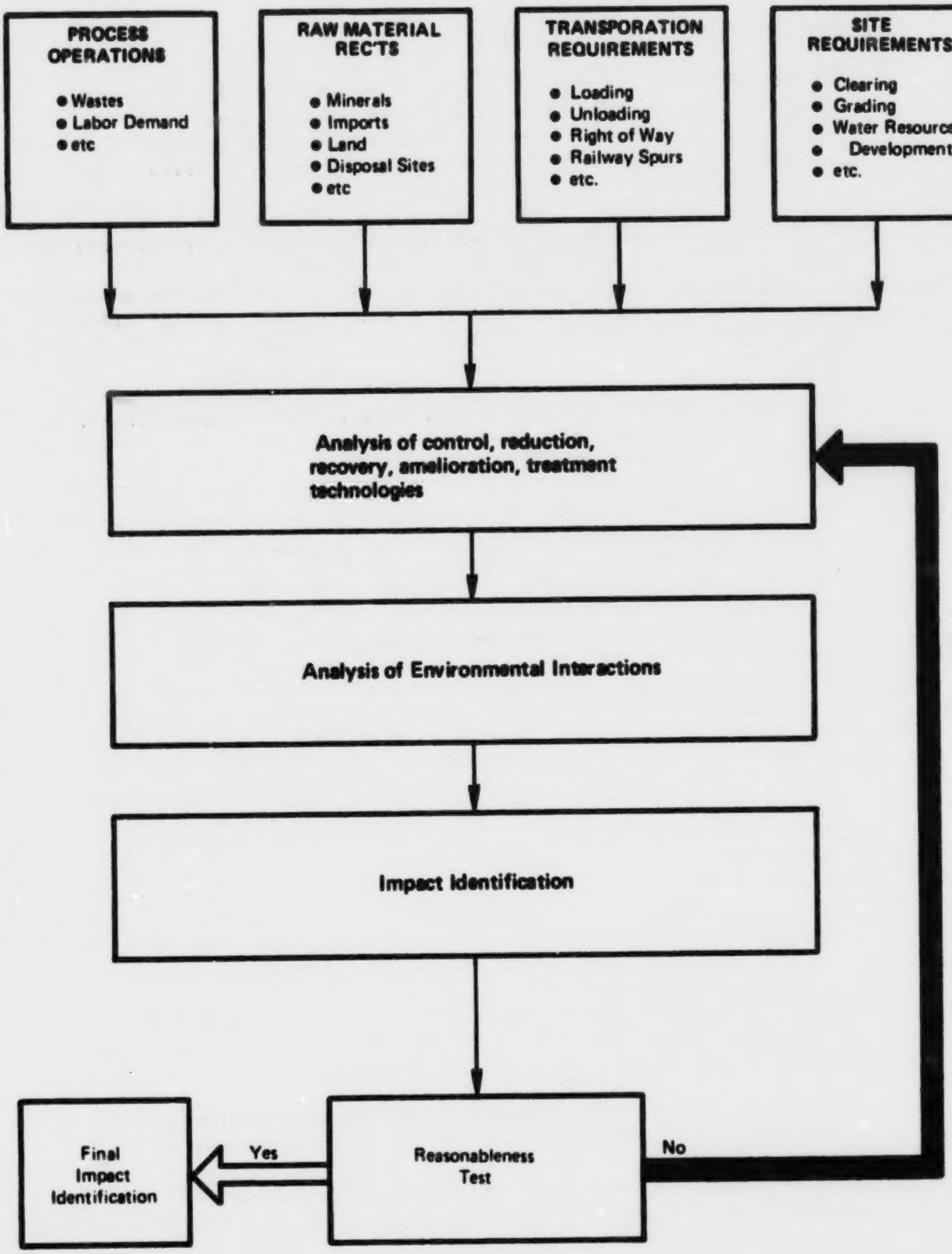

Impact Identification by Project Requirement and Operation
Process operation
Raw Material
Transportation requirements
Site requirements
Impact Evaluation and Description
Significance
Magnitude
Cumulative effects
Directness
Long-term effects
Short-term effects
Reversibility
Impact Aggregation
Determining Net Impacts on Environmental Categories
Meteorology and climatology
Air quality
Topography
Geology
Soils
Hydrology
Biology
Etc.
Effects of Proposed Project on 10-15 Year No-Project Baseline Forecast

FIGURE III-2

ENVIRONMENTAL IMPACT IDENTIFICATION PROCESS



2. Process Impacts Identification

Process impacts are identified by examination of all wastes discharged to air, water, and land. Such waste discharges must conform to applicable Federal, State and local discharge standards. In the case of solid waste discharges, no Federal discharge regulations have been published.

Description of all pollution control measures to be incorporated in the new source should be discussed, because the use of in-process pollution control measures in lieu of or supplementation to end-of-process control is a major permit consideration reflected by the New Source Performance Standards.

Waste reduction, waste recovery, and recycle should also be discussed. Differentiation should be made between traditional water and waste recycling measures and any new or unusual methods. While EPA does not require that untested techniques be employed for such recycle/reuse, it is realized that many new recycle/reuse options will be available to the process designer who is not constrained by existing buildings, process configurations, and operating procedures. Such options should be considered carefully and described in the EIA.

For purposes of showing the interdependence of air, water, solid waste generation, and pollution control operations, the applicant should supply a pollutant material balance diagram showing all emissions and discharges, with the proposed treatment systems being applied to each. Quantification and balance of material flows through this control network should be shown so that specified levels of discharge and emission may be interrelated and evaluated. The applicant should describe pollution control measures for the proposed facility, recognizing that such control measures are categorized into normal, intermittent, and emergency (spills, accidents) controls.

Description of the facilities, equipment, and manpower required for such controls shall be given.

Changes in process raw material inputs, to the extent that they will necessitate changes in pollution control operation or design, should be discussed.

Monitoring systems which support normal control systems and/or provide emergency warning or control for accidents and spills, or which provide periodic checks for ambient environmental degradation, should be described. Flow diagrams, schematics, or similar means for display of control measures in the actual process and in its auxiliary operations should be provided.

The applicant must describe, as part of the impact identification step, the regulations and other standards of performance governing each source of process waste. Such information should be presented in tabular form, following the general format shown in Figure III-3.

Identification of impact sources and demonstration of compliance with applicable regulations and standards of performance constitute the first step in impact evaluation. Additional evaluation of impact following the guidance and requirements of Section C of this Chapter must be provided in the EIA.

All uncertainties in waste source strength, rate of flow, uniformity, etc., must be stated explicitly. Appropriateness of waste recovery, control, or treatment systems should be also discussed for each waste source.

Examples of other important process-related requirements which will have impact upon the environment and must be considered in the EIA are:

Labor force requirements.
Payroll.
Noise.

These requirements will induce change in local economic and social structures, which will themselves become sources of environmental impacts (e.g. growth in supportive industries). See Section C for discussions of indirect impacts.

3. Raw Material Impact Identification

The EIA must consider and identify impacts resulting from raw material operations directly associated with the proposed new source. Such operations shall include off-loading, conveying, pretreatment, storage, and similar operations performed on or adjacent to the proposed new source site. Detailed guidance appropriate for the proposed new source is presented in the appropriate appendix.

4. Transportation Impact Identification

The EIA must consider and identify impacts resulting from the transportation requirements of the proposed new source. Examples of such transportation considerations are new rights-of-way which must be cleared and constructed, increased road usage, and construction of spurs and access roads. Additional details are presented in the appropriate appendix.

FIGURE III-3
TABULAR SUMMARY OF STANDARDS AND REGULATIONS

SOURCE IDENTIFICATION	CONCENTRATION AVG. & MAX.	QUANTITY (FLOW RATE) AVG. & MAX.	METHOD OF DISPOSAL	STANDARD OR REGULATION		RESPONSIBLE REGULATORY AGENCY	OTHER
				REQUIREMENT	PROPOSED		

5. Site Impact Identification

The EIA must consider and identify impacts resulting from the development and utilization of the proposed facility site. Following are examples of impacts resulting from site development and utilization:

Loss of prime agricultural land (if applicable).
Erosion during and after construction.
Wildlife habitat loss.
Aesthetic degradation and property value diminution.

6. Other Impacts

To the extent that they are not covered in foregoing items 3 through 6, the following impact identification requirements apply:

a. Accidents and Spills

Accidents and spills potentially impacting on the environment should be described. An estimate of the likelihood of occurrence should also be given; this should be based on historical records of similar existing facilities whenever possible, or on the judgment of the applicant and his consultants. Asumptions should be clearly stated and defended.

De-emphasis or oversight of potential accidents and spills by the applicant, on the basis that safety or management programs are planned, is not acceptable. While such programs may well reduce or even eliminate the occurrence of accidents and spills (and should, therefore, be described), it is important that all such potential impacting events be identified.

The significance of accidents or spills as environmental impacts is determined by many factors, some of which are as follows:

Acute toxicity.
Volatility, odor, and flammability.
Treatability by conventional waste treatment methods.
Damage/upset of biological waste treatment systems.
Shock or stress on biotic communities.
Persistence in food chains.
Collectibility.

b. Environmentally-Sensitive Areas

The EIA should explicitly describe impacts affecting the environmentally-sensitive areas identified in Chapter II, Section C.9.

c. Population and Economic Growth

The extent to which the proposed new source may affect the project population levels (Chapter II, Section C.10.) should be described.

d. Other Programs in the Area

The extent to which the proposed new source may interact with any local, state, or federal projects (Chapter II, Section C.11.) should be described.

e. Land Media

The extent to which any impact of the new source will alter land use plans should be described.

C. Impact Evaluation

1. General

After the impacts from each of the project requirements and operations are identified as specificed in Section B, the impacts must be evaluated and described. This should be done using the following descriptors, which are explained in greater detail in the sections that follow.

Significance.
Magnitude.
Cumulative effects.
Directness.
Long-term effects.
Short-term effects.
Reversibility.

2. Universal Assessment Methodology

No universal methodology for evaluating environmental impacts exists.

Because impacts have highly-variable characteristics, they are not generally quantifiable in units which allow easy evaluation. For example, loss of open space is an impact measurable in terms of acreage, standing biomass (quantity of living matter), numbers of picnic benches, miles of nature trails, or, on the other hand, construction revenue, employment, tax base, etc. None of these parameters is readily differentiable or meaningful without verbal description.

It is the responsibility of the new source applicant in preparing the EIA to ensure that any judgment criteria or assumptions made in assessing their importance be explicitly stated.

3. Methodology Success

In general, the success of any assessment methodology is measurable on the basis of its:

Accuracy - Ability to portray comprehensively and fairly all impacts.

Replicability - Ability to be used by different investigators of the same subject with equivalent results.

Economy - Reasonableness of demands upon the analyzer for time and for sophisticated computational techniques.

Understandability - Ability to be understood by persons of different backgrounds.

These criteria are the most important measures of the methodology's success for the specific analysis being done by the EIA applicant.

(For further discussion of Impact Assessment Methodologies, the applicant should refer to: "A Review of Environmental Impact Assessment Methodologies," EPA 600-5-74-002, April 1974. This document is available from the U.S. Government Printing Office.)

4. Significance vs Magnitude

Each action impacting the environment should be described in a way which differentiates the significance of the action and the magnitude of the action.

Magnitude is measurable by some physical property of the impact, and significance is measurable by using some weighting factor or other relative measure which describes how important, in terms of benefit or detriment, that impact is.

For example, organic wastes can be described in terms of magnitude by such units as "pounds of total organic carbon", but the significance of the organic waste will be a function of such characteristics as "Toxicity" (sugar is less toxic than phenol).

Magnitude factors may be described through normal parameters of quantification.

Significance factors, on the other hand, may require:

Consideration of all chemical, physical, and biological effects of the potential-impact substance or action, to determine which properties have special importance upon impact estimation.

Description of the impacts such properties will likely or potentially produce.

Judgmental evaluation of whether the described effects are significant, and prioritization of that significance in relation to the significance of other potential impacts.

5. Inevitable vs Possible Impacts

The EIA preparer should also be cognizant of another important dimension of impact - that is, the probability of occurrence.

For convenience, probability may be described in terms of:

Possible Impacts - Impacts which are not certain to occur but which may be important since they may have very high significance.

Inevitable Impacts - Impacts which are more certain and directly treatable by graphs or ratios in that they are normally related proportionately to some parameter of size, such as size of production, acreage of land, flow of a river, etc.

6. Cumulative Impacts

The applicant should consider the cumulative effects of all proposed actions, in addition to the effects of each action alone. This distinction is important in that individually such actions may be small but cumulatively they may be large.

For example, a new refinery sited in the Carribbean typically involves destruction of coral communities at a level which, for the individual new source under review, appears small. The impact, however, is much greater because the destruction of one area may lead to future industrial siting in that area because of the lowered environmental quality of the area, hence leading to more reef destruction, and so on.

7. Primary and Secondary Impacts

The most important distinction which the applicant must address in analyzing impacts is that between primary (also called "direct") impacts and secondary (also called "induced") impacts.

> Primary impacts are defined as those attributable to the action of process wastes, demands upon resources, accidents or abnormal conditions of operations, and initial project construction.
>
> Secondary impacts are defined as those attributable to some indirect demand or impact of the project upon the environment, society, or economy which occurs or becomes important at some different point in time or space, or in some other sector of the environment, society, or economy.

For example, fugitive losses from the manufacturing process or the alteration of air quality by stack emissions is a primary impact of the project.

The alteration of housing values because of degraded air quality (odors, corrosive properties) is a secondary impact. Secondary impacts are of great importance to the overall evaluation of any new source proposal because they may be:

a. Less obvious and, hence, commonly overlooked in weighing project costs and benefits.

b. Less easily controlled or ameliorated.

c. Often more important than the direct impacts, especially when they involve inducement of growth in other impacting industries.

Examples of secondary impacts are:

Increased water supply treatment costs to users downstream of wastewater discharge.

Increased pressure upon remaining recreational lands, parks, etc., as a result of development of existing recreational lands.

Increased water use resulting from labor influx.

Increased investment of industries supporting the new source industry.

Increased costs of cleaning windows, cars, streets, etc. made dirty by air pollution; increased traffic and congestion.

Increased electrical utility growth to meet new housing industry and residential demands.

Such secondary impacts should be considered in preparing the EIA and discussed in detail where significant impacts will occur.

8. Long-Term vs Short-Term Impacts

Unlike the description of primary versus secondary impacts, which account for the cause-effect or chain-reaction nature of impacts, the description of long-, and short-term aspects of impacts must account for the impacts' persistence. For example, a primary impact of land disposal of certain effluents is the removal of that land from other uses such as agriculture. If certain metals or toxic substances are contained in it, this impact will be persistent or long-term. In some cases primary impacts, if highly persistent, may be the most important consideration.

9. Reversibility

The reversibility of an impact accounts for the degree to which the impact may be nullified and the base environmental condition restored. Reversal may be effected by or assisted by natural forces (biodegradation) or by direct clean-up effort.

D. Impact Aggregation

After the impacts are identified, evaluated, and described as specified in Sections B and C, they should be aggregated according to the same set of environmental elements as employed in describing the baseline environment in Chapter II. The interactions among the impacts identified in each category should be explicitly discussed. The cumulative effects of the interacting impacts on each category should be evaluated and described using the same descriptors in Section C. Since the impacts identified in Section B.6.b - B.6.C are already organized in terms of some of the environmental categories, part of the aggregation process will have already been completed.

After the aggregation process is completed, the effects of all the identified and evaluated impacts on the ten to fifteen (10-15) year no-project environmental baseline forecast made in Chapter II will be discussed.

CHAPTER IV

ALTERNATIVES TO THE PROPOSED NEW SOURCE

A. General

This chapter in the EIA must present the alternatives considered by the applicant during the new source development process.

The scope of alternatives which the applicant must consider is set forth in the sections which follow. Criteria are provided to assist applicants in determining the proper scope of the analysis; however, the responsible official should be consulted to ensure that there is no difference of opinion on the scope.

B. Special Considerations

1. Environmental factors must be identified and considered early in the project planning effort, to assure that selection of alternatives properly reflects all important issues.

   The alternative optimization process may be accomplished by evaluating all reasonable alternatives against a set of pre-established economic, environmental, and related factors which measure the success or conformance of each alternative.

   In all cases, the applicant should consider environmental factors in addition to economic and other factors in the selection decision.

2. The scope of alternatives which must be presented by the applicant in the EIA should be related to the level of impact which is associated with the proposed new source (as described in Chapter III).

   This policy recognizes that not all alternatives considered during the project planning effort can be reasonably covered in the EIA. Thus, in cases where minimal impact can be demonstrated for the proposed new source, fewer alternatives need be presented in the EIA.

   Criteria which define the scope of alternatives which must be discussed in the EIA are presented in Section C of this chapter.

3. The applicant should also consider the extent of public interest in the proposed new source in determining the scope and detail

of alternatives which must be considered. Public concern is considered an important input in the impact assessment process, since it provides a measure of otherwise unquantifiable elements, such as aesthetic impact, land use preferences, etc. Public and industrial concerns are rationally interrelated by the EIA and EIS process.

4. Applicants must be candid and fully discriptive in discussing new source impacts and alternatives, since EPA's EIA review will encompass several levels of technical review by governmental and public groups. In all cases, consideration is given to ascertaining whether reasonable alternatives that would entail less environmental impact have been overlooked. Oversight by the applicant of impact-reducing options, or downplay of impacts associated with the proposed new source will lengthen EIA review and delay acceptance.

C. Criteria

1. Criteria for determining the alternatives to be described and compared in the EIA are presented in Table IV-1.

2. In all cases, the alternative of taking "no action" (that is not building the proposed new source) must be considered.

3. Each criterion presented in Table IV-1 requires that additional alternatives be described in the EIA if a certain key environmental consideration or objective is not met by the new source proposal.

4. The criteria do not specify all details of the additional alternatives which must be considered. Rather, they specify the:

   Specific characteristics of the proposed action that are likely to have significant adverse environmental impact.

   Number of alternatives which must be considered in addition to the proposed action.

5. In all cases, the applicant should present sufficient detail to show why the proposed action is the best alternative.

D. Detail of Alternative Description

1. In general, alternatives specified for consideration in Table IV-1 may be discussed with less detail than those for the proposed new source.

Table IV-1

No.	Criteria - Process Related	Requirement
1	The proposed process is likely to be controversial, for environment or public-health reasons.	Consider at least one other process option.
2	Process technology for industry in question is rapidly developing or expanding.	Consider postponement of the project.
3	Pollution control technology is rapidly expanding for some critical or costly facet of the industry.	Consider postponement of the project.
4	Renovation/expansion of existing facilities would eliminate the need to develop natural areas.	Consider renovation/expansion.
5	The proposed project will rely upon relatively unproven technology.	Consider at least one other process option.
6	The proposed project utilizes scarce or rapidly diminishing resources (e.g., natural gas).	Consider at least one other process using other resources.
7	The proposed project has several raw materials options.	Consider all raw material options, and determine one causing lowest pollution load.
8	Others, as defined by EPA Regional Administrator	

Table IV-1
(continued)

No.	Criteria - Site Related	Requirement
1	The proposed new source location is likely to be controversial.	Consider at least one additional site.
2	The proposed new source and/or associated facilities would infringe upon scientifically valuable areas, as determined by site uniqueness, primitiveness, amenability to study or observation. Such sites may be defined by local universities, colleges, research organizations, etc.	Consider at least one additional site.
3	The proposed new source and related facilities would directly or indirectly infringe upon recreational lands, park lands, wildlife refuge lands.	Consider at least one additional site.
4	The proposed new source and related facilities would either directly or indirectly accelerate change in rural, pristine, or agricultural land areas.	Consider at least one additional site.
5	The proposed new source and related facilities would induce secondary residential, industrial, and/or commercial growth in the community which could not be supported by existing community services and financial capabilities.	Consider at least one additional site.
6	The proposed new source and related facilities would cause traffic congestion in the vicinity of the proposed site.	Consider at least one additional site.
7	The proposed site is prone to flooding, hurricane, earthquake, or other natural disasters.	Consider at least one additional site.
8	The proposed new source and related facilities would infringe directly or indirectly upon endangered species or their habitat, or upon wetlands, (including fresh-water wetlands), upon wild and scenic rivers, or sensitive or unique ecosystems.	Consider at least one additional site.

Table IV-1
(continued)

No.	Criteria - Site Related	Requirement
9	The proposed new source and related facilities would infringe directly or indirectly upon historical sites currently included or proposed for inclusion within the National Registery of Historical Landmarks. Archaeologically important sites are likewise covered by this criterion.	Consider at least one additional site.
10	Others to be specified by EPA Regional Administrator.	

Where alternatives which were environmentally more acceptable were found but disqualified, the applicant is expected to state what overriding economic, technological, or related considerations were involved.

The applicant is required to explore alternatives to the extent necessary to:

a. Provide a general description of the alternative's environmental characteristics (baseline, sensitive ecosystems, natural features).

b. Provide a discussion of what is environmentally more or less acceptable about the alternative compared to the proposed new source, and of the factors that have influenced the final decision not to adopt this alternative.

2. Moreover, the applicant is responsible for discussing alternatives in a manner wherein:

   a. Narrative style does not require extensive scientific or technical expertise.

   b. Full consideration is given (sometimes qualitatively) to each impact's significance, magnitude, likelihood of occurrence, cumulative effects, short-term and long-term effects, reversibility, and secondary or induced effects.

   c. All tradeoffs, assumptions, and judgments utilized in weighing environmental costs against social and economic costs are described.

3. The applicant shall provide a tabular summary of the alternatives finally considered and of the major considerations which have been analyzed and compared for each.

   For this purpose, the format provided in Table IV-2 should be followed.

   The recommended format may not permit direct summarization of considerations within the table, for reasons of space and economy of size. Instead, the applicant should specify within the table what considerations have been analyzed for the respective alternatives, by way of page and paragraph number citation. Where feasible, a relative estimate of impact significance should be included in the table.

TABLE IV-2
GENERAL FORMAT FOR SUMMARIZING ALTERNATIVES

NEW SOURCE TITLE	ALTERNATIVE A		ALTERNATIVE B		ALTERNATIVE C		ALTERNATIVE D		ALTERNATIVE E	
	(BRIEF DESCRIPTION)									
Impact Description	Significance	Page	Significance	Page	Significance	Page	Significance	Page	Significance	Page
(Examples): 1. Process Impacts Solid Waste Disposal Effects Water Quality Effects Aesthetic Effects 2. Site Impacts Loss of Agricultural Land Erosion Loss of Habitat Traffic Congestion 3. Etc.										

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APPENDIX A

MISCELLANEOUS DOCUMENTATION

A.1 Forecasting Economic Changes and Induced Inputs

The need for a straightforward method of predicting changes in the economic base of the affected region is recognized in order to reasonably forecast important secondary impacts. Specifically, the following fundamental economic impacts can be approximated:

The proposed industry's role as exporter or importer within its region of influence.

The multiplier effect of the proposed industry, approximating the amount of secondary investment which will be stimulated in other supportive industries.

An insight into stimulation of other industries and the approximate levels of stimulation.

a. Location Quotients

Location quotient analysis is a technique which uses commonly available data on industrial employment levels and permits differentiation between exporting industries (also called basic industries) and importing industries (also known as non-basic). The terms importing and exporting are used here to describe the industry's economic role within its region.

A generally-used definition of region is the Standard Metropolitan Statistical Area (SMSA) inasmuch as data are readily available within the SMSA, and the unit approximates, to some degree, commonality between the industry, its sources of supplies, and its markets.

Location quotient analysis relies upon the situation that the basic or exporting industries generally support the non-basic or importing industries. Basic industries will generally have the greatest environmental (and economic) impact.

The level of support which basic industry provides for non-basic industry is determined in the following manner:

1. A comparison is made between local employment level for the industry which includes the proposed new industry, and total employment level within the affected region.

2. Likewise, a comparison is made between the national employment level for that industry to total national employment.

3. If the ratios expressed in step 1 and step 2 are compared (by dividing $R_{STEP\ 1}$ by $R_{STEP\ 2}$), a measure of the proposed industry's status as basic or non-basic will be made. For example, if the resultant ratio is less than one, the industry is termed non-basic to the local economy, reflecting the fact that locally, the proposed industry is not producing a "fair share" relative to the rest of the nation and hence is a net importing or non-basic industry within its region.

   Conversely, if the ratio is greater than one, the industry is producing locally more than its share and may be termed a net exporter or basic industry.

4. A more realistic ratio may be obtained if $R_{STEP\ 1}$ is compared to the $R_{STEP\ 2}$ which is based on state employment data or a region which reflects more appropriately the industry's economic community.

b. Multiplier Effects

An estimate induced investment in non-basic industries which will occur as consequence of the direct investment in basic industries is made on the basis of the multiplier concept.

"The familiar multiplier concept states, in brief, that an increase in the exports of a region will lead to an increase in regional employment and, therefore, to an increase in regional income. This increased income will, in turn, be spent and induce a second round of increased regional employment and income which will also be spent to induce more income, and so on, to a finite limit. The calculated regional multiplier is an estimate of that finite limit. It is an estimate of the total amount of income generated by an injection of one dollar of new income into the region." (Schenker, 1970).

A measure of the multiplier effect is the ratio of total employment in the affected region to the total employment for all basic industries.

A sample calculation for a hypothetical location and industry is provided in Table A-1.

Care must be exercised in indiscriminately applying the multiplier so calculated because it assumes that the proposed industry will behave identically to those basic industries already there. This

Table A-1

Sample Calculation of Employment, Employment Coefficient, and Location Quotient for Hypothetical Community

	(1) Employment Hypothetical Community	(2) Coefficient U.S.	(3) Coefficient Local	(4) Location Quotient (3) ÷ (2)
Agriculture	*6,106	.03710	.58335	*15.73720
Chemical & Allied	11	.01290	.00105	.08140
Construction	59	.05972	.00564	.09444
Utilities and Sanitary Services	95	.01677	.00906	.54085
Food and Kindred	*2,603	.01816	.24868	*13.69380
Textile Mills and Fabricated Textiles	5	.02853	.00047	.01647
Trucking & Warehousing	80	.01414	.00764	.54031
Communications	*16	.01402	.01530	*1.09130
Railroads	23	.00831	.00219	.26353
Printing & Publishing	42	.01556	.00401	.25777
Machinery, except Electrical	98	.02600	.00930	.36000
Furniture, Lumber and Wood Products	*169	.01278	.01614	*1.26291
Eating Establishments	304	.03003	.02904	.96703
Education	97	.08030	.00926	.11530
Non-profit	42	.01519	.00401	.26398
Professional	151	.02552	.01443	.56543
Governmental	566	.05488	.05407	.98524
Total	10,467			
Total Basic Industries	8,894			

Multiplier: $\frac{10,467}{8,894} = \underline{1.18}$

*Indicates a "Basic" industry.

assumption is not valid for industries where the product being manufactured will be rapidly exported out of the region... that is, not permitted to stimulate growth in "finishing" industries, transportation, warehousing, etc.

By examination of the way in which the proposed industry will be linked with the proposed economic setting in comparison to the linkages between existing basic industries and the economic setting, a qualitative judgment can be made as to whether the calculated multiplier may be high or low, by what approximate amount; adjustments can then be made accordingly.

Moreover, rapid technological changes in industry manufacturing process will alter traditional industry interdependencies and affect the validity of the results. The impact assessor should consider such variables before applying the technique.

c. Industries Which Will Be Stimulated

An estimation of the kinds of industries which will be stimulated by the proposed industry may be derived using Bureau of Economic Analysis data for the "Input-Output" ("I-O") structure of the U.S. economy, which relates the effect that investment in one industry will have on other industries.

The A data applies nationally and, to that extent, is a measure on an industry-specific basis of the induced economic impact that the proposed industry will have. For example, a dollar of investment in petroleum refining will induce economic growth in other industries (per dollar) as shown below:

1.	(New) Petroleum Refining	1.086
2.	Chemicals and Selected Chemical Products	0.114
3.	Plastics and Synthetic Materials	0.062
4.	Paints and Allied Products	0.054
5.	Other Agricultural Products	0.052
6.	Transportation and Warehousing	0.050
7.	Stone and Clay Mining	0.043
8.	Maintenance and Repair	0.037
9.	Livestock	0.032
10.	Business Travel and Entertainment	0.032
11.	New Construction	0.030
12.	Forestry	0.028
13.	Broad and Narrow Fabrics and Yarns	0.026
14.	Stone and Clay Products	0.026
15-82.	All Others	0.068

It is noted that the BEA "I-O" statistics have been developed four times over a twenty-year period, the most recent estimate being for the base year of 1967. These recent I-O data were published in February, 1974.*

These data will be useful as a gross estimate of induced change. Rapid technological changes occurring today again affect the accuracy of this measure. (This limitation is naturally most applicable to industries where greatest technological development is occurring. However, for the purpose of a simple means for economic impact analysis in preparation of EIA's, this analytical technique will be of some value.)

A.2 Computer Models

Forecasting methodologies based upon computerized modeling approaches have been developed for solving a wide variety of environmental problems, with varying success. While a discussion of each available model and explanation of the application to which it is suited are outside the scope of this manual, a reference list of the most common models is provided below.

Use of modeling approaches should generally be required only for large new source projects or for projects known to have a very significant environmental impact. Inasmuch as such successful modeling requires a high degree of skill in inter-relating natural environmental parameters with projected process parameters in a manner consistent with the basic assumptions inherent in the model, expert assistance may be required in employing modeling techniques.

a. Water Resources

1. Storm Water Management Models

   Such models are able to provide simulation of storm and combined sewer systems, including the computation of both flow and quality of storm and sanitary runoff.

2. Storm Sewer Design Models

   Storm sewer design models are used to calculate the runoff hydrograph at inlets of sewer lines of a sewer system network, and to find the sizes of the individual sewer lines from known invert elevations.

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*For a summary, refer to "Survey of Current Business", Volume 54, No. 2, February, 1974, U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of Economic Analysis.

3. Sanitary Sewer Design Models

   Such models assist in the design of sanitary sewer systems. The input data typically include geometry of the system, minimum and maximum permissible velocity, minimum depth of cover, wastewater flow rate, infiltration rate, and minimum sewer slope. Output will include a table giving all design information (e.g., size of pipes, invert elevations, slopes, capacities, velocity of flow, etc.).

4. Plume Models

   Plume models are used for analysis of the effect of pipeline discharges of pollutants (municipal, industrial, or thermal) in stagnant, density-stratified water bodies such as lakes, reservoirs, estuaries, and oceans.

5. Stream Assimilative Capacity Models

   Such models simulate dissolved oxygen (DO) levels in a stream resulting from a sequence of point and/or distributed BOD loadings. Models can also allocate point source load reductions as required to maintain a specified DO standard and calculate the corresponding treatment efficiencies required.

6. DOSAG 1 and QUAL 1

   DOSAG 1 and QUAL 1 are used to predict water quality of streams due to pollution loads. QUAL 1 simulates the spatial and temporal variations of parameters such as BOD, DO, temperature, and conservative minerals in streams. It allows for multiple waste discharges, withdrawals, tributary flows, and incremental runoff. QUAL 1 is used to study a stream system in great detail; the DOSAG 1 Model is used to analyze the same system in lesser detail, but under a larger range of conditions.

7. Water Surface Profiles

   This model computes and plots the water-surface profile for river channels of any cross-section, under various conditions of flows. The effects of hydraulic structures such as bridges, culverts, weirs, embankments, and dams may also be computed. The program can be used for determining water profiles and flooding areas of a watershed under floods of various return frequencies.

8. System Design Optimization

This is a simulation tool which assists the engineer in evaluating treatment plant process designs from the standpoint of the variability of effluent characteristics. More specifically, SDO predicts the variability of certain effluent characteristics so that alternative designs or alternative operating modes may be compared with respect to their effectiveness in producing the required effluent. Hence, by using SDO to look at various design alternatives, the engineer can establish the cost of providing additional reliability into designs and, therefore, use this program to determine the most cost-effective design.

9. Thermal Plume Prediction Model

This model describes the behavior of heated surface jets for a wide range of ambient and initial discharge conditions encountered in practice. The surface discharge of heated water is often chosen over the submerged discharge because it involves a greater rate of heat transfer to the atmosphere due to normally higher surface temperatures. The solutions obtained using this model are limited to a uniform and steady surface discharge of heated water from a rectangular channel into a large and deep body of water that is either at rest or moving at a uniform and constant velocity. The output provides results describing the surface plume trajectory, width, temperature, depth, surface area, and time of travel along the plume centerline.

10. Dispersion of Barged Wastes in Ocean Waters

A simple one-dimensional dispersion equation has been modeled to predict the dispersion of liquid wastes in ocean waters. The model predicts the concentration of the waste on the surface along the centerline of the wake of the barge at various times after discharge. This provides a means of estimating the rate of discharge of pollutant necessary to meet specific concentration limits. This model gives conservative values of pollutant concentration. The input data include the capacity and the speed of the barge, time of disposal, and horizontal dispersion coefficient.

b. Air Resources

1. AQDM: The Air Quality Display Model calculates the dispersion of pollutants by mathematical simulation of the study area. This is accomplished through application of meteorological data to measure source output. The source output dispersion is mathematically applied to observed sampling station data and source contributors for specific geographic areas. The Briggs or Holland plume-rise equation may be used. The AQDM program has been extensively used for regional air quality and industrial impact studies. (AQDM has been developed by the Environmental Protection Agency.)

2. APRAC: This computes the hourly averages of carbon monoxide as a function of extra-urban diffusion from automotive sources in upwind cities, intra-urban diffusion from roadway sources, and local diffusion within a street canyon. The model requires an extensive emission or traffic inventory for the city of interest. Requirements and technical details are documented in "User's Manual for the APRAC-1A Urban Diffusion Model Computer Program" which is available from NTIS (access number PB-213-091).

3. CDM: The Climatological Dispersion Model (CDM) determines long-term (seasonal or annual) quasi-stable pollutant concentrations at any ground-level receptor using average emission rates from point and area sources and a joint frequency distribution of wind direction, wind speed, and stability for the same period. This Environmental Protection Agency model differs from the Air Quality Display Model (AQDM) primarily in the way in which concentrations are determined from area sources, and in the use of an increase in wind speed with height dependent upon stability. CDM uses a separate data set for the area of interest.

4. PTMAX: Is an interactive program which performs an analysis of the maximum, short-term concentration from a point source as a function of stability and wind speed.

5. PTDIS: Is an interactive program which computes short-term concentration downwind from a point source at distances specified by the user.

A.3 References

AIR QUALITY

1. Nationwide Air Pollutant Emission Trends 1940-1970, N73-27537 BB

2. Effects of Sulfur Oxides in the Atmosphere on Vegetation; Revised Chapter 5 for "Air Quality Criteria for Sulfur Oxides" (NTIS No. PB-226 314/3 BB) EPA-Re-73-030

3. A Time and Space Study of Pollutants (NTIS No. PB-226 421/6)

4. The Uses of Meteorologic Data in Large Scale Air Pollution Surveys (NTIS No. PB-226 423/2)

5. The National Air Monitoring Program: Air Quality and Emissions Trends Vol. I (NTIS No. PB-226 490/1 BB) EPA-450/1-73-001a

6. Program for Reduction of NOx from Tangential Cool Fired Boilers, Phase I (NTIS No. PB-226 547/8) EPA-650/2-73-005

7. National Air Quality Levels and Trends in Total Suspended Particulates and Sulfur Dioxide Determined by Data in the National Air Surveillance Network (NTIS No. PB-227 059/3)

8. A Cost Effectiveness Study of Air Pollution Abatement in the National Capital Area (NTIS No. PB-227 110/4)

9. A Cost Effectiveness Study of Air Pollution Abatement in the Greater Kansas City Area (NTIS No. PB-227 116/1)

10. A Cost Effectiveness Study of Particulate and SOx Emission Control in the New York Metropolitan Area (NTIS No. PB-227 121/1)

11. The National Air Monitoring Program: Air Quality and Emission Trends, Annual Report Volume II (NTIS No. PB-227 272/2) EPA-450/1-73-001b

12. Air Pollution Survey, Report 1 & 2, Air Pollution Emissions in the Delaware Valley (NTIS No. PB-228 043/6 & PB-228 162/4 respectively) Drexel Institute of Technology 1966

13. Problems of the Recognition and Evaluation of Effects of Gaseous Air Impurities on Vegetation (NTIS No. PB-229 740)

14. Regional Air Pollution Analysis (NTIS No. PB-230 872) EPA-450/3-74-009

15. Emission Factors for Trace Substances (NTIS No. PB-230 894) EPA-450/2-73-001

16. An Urban Atmospheric Dispersion Model ANL/ES-CC-5.

17. Comprehensive Study of Specified Air Pollution Sources to Assess the Economic Impact of Air Quality Standards (NTIS No. PB-222 857/5) APTD-1547

18. Cost of Air Pollution Damage: A Status Report (NTIS No. PB-222 040/8) EPA 9:85

19. A Survey of Emissions and Controls for Hazardous Wastes and Other Pollutants (NTIS No. PB-209 559)

20. A Compilation of Air Pollutant Emission Factors (2nd Edition) (NTIS No. PB-223 996/0) EPA 9:42

21. Development of Methodology to Permit Projection of Air Pollution Emissions for Geographic Areas (NTIS No. PB-220 433/7) EPA-41u-723 APTD-1464

22. Air Quality Display Model (NTIS No. PB-189 194) TRW Systems Group, 1969

23. Intermedia Aspects of Air and Water Pollution Control (NTIS No. PB-224 812/8) EPA-600/5-73-003

24. Costs and Economic Impacts of Air Pollution Control: Fiscal Years 1970-1975 (NTIS No. PB-227 022/1) Ernst & Ernst, 1969

25. Biological Aspects of Air Pollution: An Annotated Bibliography (NTIS No. PB-227 104/7) US PHS 1950

26. Cost of Monitoring Air Quality in the United States (NTIS No. PB-231 169) EPA-450/3-74-029

27. Federal Air Quality Control Regions (NTIS No. PB-229 701/8) AP-102

28. Directory of Air Quality Modeling Sites, 1912 (NTIS No. PB-231 003) EPA-450/2-73-006

29. Supplement No. 1 for Compilation of Air Pollutant Emission Factors, Second Edition (NTIS No. PB-228 708/4) EPA-OAQPS, July 1973

30. Compilation of Air Pollutant Emission Factors, Second Edition (NTIS No. PB-223 996/0) AP-42

31. Cost of Air Pollution Damage: A Status Report (NTIS No. PB-222 040/8) AP-85.

WATER QUALITY

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2. "Physical and Economic Factors Associated with the Establishment of Stream Water Quality Standards." Volume I, Iowa State Water Resources Research Institute, March 1970

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1. Biological Aspects of Air Pollution: An Annotated Biobliography (NTIS No. PB-227 104/7) US PHS, April 1950

2. Bio-environmental Impact of Air Pollution from Fossil Fuel Power Plants (EPA 660/3-74-011)

3. Biological Effects of Air Pollution - Biobliography (EPA 15080 FHU 10/69) Selected Bibliography (NTIS No. PB-213 483)

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2. Studies on Modifications on Solid Industrial Wastes (NTIS No. PB-222 419/4) EPA-670/2-73-065

3. A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods, Vols. I-III (NTIS No. PB-221 465/8, PB-221 466/6, PB-221 467/4 respectively) EPA-670/2-73-14, 15, 16

4. Recommended Methods of Reduction, Neutralization, Recovery, or Disposal of Hazardous Waste. EPA-670/2-73-053a thru p.

    1. Vol I - Summary Report (NTIS No. PB-224 580/1)
    2. Vol II - Toxicological Summary (NTIS No. PB-224 581/9)
    3. Vol III - Disposal Process Descriptions. Ultimate Disposal, Incineration, and Pyrolysis Processes (NTIS No. PB-224 582/7)
    4. Vol IV - Disposal Process Descriptions. Biological and Miscellaneous Waste Treatment Processes (NTIS No. PB-224 583/5)

    5. Vol V - National Disposal Site Candidate Waste Stream Constituent Profile Reports. Pesticides and Cyanide Compounds (NTIS No. PB-224 584/3)
    6. Vol VI - National Disposal Site Candidate Waste Stream Constituent Profile Reports. Mercury, Arsenic, Chromium, and Cadmium Compounds (NTIS No. PB-224 585/0)
    7. Vol VII - National Disposal Site Candidate Waste Stream Constituent Profile Reports. Propellants, Explosives and Warfare Material (NTIS No. PB-224 586/8)
    8. Vol VIII - Radioactive Materials (NTIS No. PB-224 586/8)
    9. Vol IX - Organic Compounds
    10. Vol X - Organic Compounds, continued
    11. Vol XI - Inorganic Compounds
    12. Vol XII - Inorganic Compounds, continued
    13. Vol XIII - Summary of Waste Origins, Forms and Quantities
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2. Laws and Regulatory Schemes for Noise Abatement (NTIS No. PB-206 719) EPA-NTID 300.14

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4. National Survey of the Odor Problem. Phase I Study of the Social and Economic Impact of Odors (NTIS No. PB-194 376)

5. Economics of Air and Water Pollution (Blacksburg, Water Resources Research Center, Bulletin 26)

6. Environmental Quality in a Growing Economy. Resources for the Future, Inc., Johns Hopkins Press

7. Economics of Outdoor Recreation, Resources for the Future, Inc., Johns Hopkins Press, 1966.

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APPENDIX B-1

RUBBER PROCESSING INDUSTRY

Introduction

This Appendix supplements, for the Rubber Processing Industry, the instructions provided in the General Assessment Guideline. The applicant should discuss in the EIA all relevant impacts discussed in the sections which follow. The material in the EIA should be in the format described in the General Assessment Guideline.

Overview of the Industry

The Rubber Processing Industry may be regarded as the following five distinctly different industry components:

I. Tire and Inner Tube Industry.
II. Synthetic Rubber Industry.
III. Molded, Extruded, and Fabricated Rubber Products Industry.
IV. Reclaimed Rubber Industry.
V. Latex-Based Products Industry.

This industry categorization coincides with the U.S. Department of Commerce Standard Industrial Classification, and has already been adopted by EPA in a nation-wide survey of the industry for purpose of effluent source analysis and development of EPA Effluent Limitations Guidelines.

The Appendix which follows has been divided, according to this categorization, into individual sub-appendices.

I. TIRE AND INNER TUBE INDUSTRY

I.A Impact Identification

Impacts which must be described by the applicant are described herein.

I.A.1 Process Impacts

Using process flow diagrams such as those provided in Figures B-1-1 and B-1-2, the applicant should describe all sources of process waste. The diagrams presented have been developed for water pollution survey studies, and, thus, are not complete regarding air and solid waste sources. Minimum requirements which the applicant should address in the EIA are presented in the following sections (see Reference No. 1).

I.A.1.a Effluents

(1) Cooling Water

Specific attention should be given to maximizing water recycle or reuse by means of recirculating cooling water systems. (See General Assessment Guideline.)

(2) Utility Services Wastes

Aqueous wastewaters associated with cooling water and steam supply systems should be defined and described. Such wastes include boiler blowdowns, cooling system blowdowns, and raw water treatment system wastes.

(3) Spills and Washdowns

Intermittent sources of wastes, such as those generated by spills, leaks, and routine plant housekeeping should also be described. Particular attention should be drawn to soapstone and latex dip areas.

Figure B-1-1

FLOW DIAGRAM FOR TYPICAL TIRE AND CAMELBACK PRODUCTION FACILITY

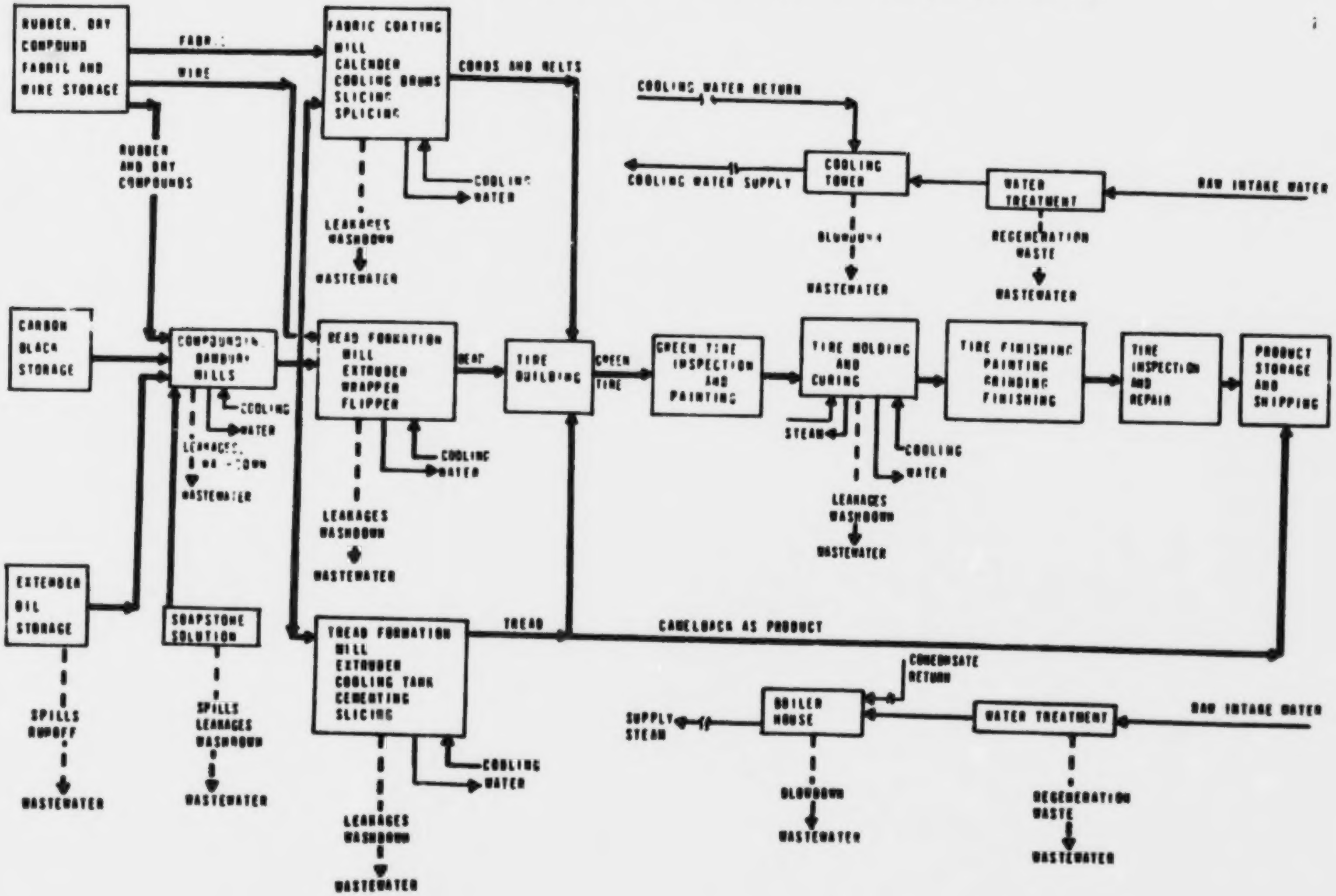
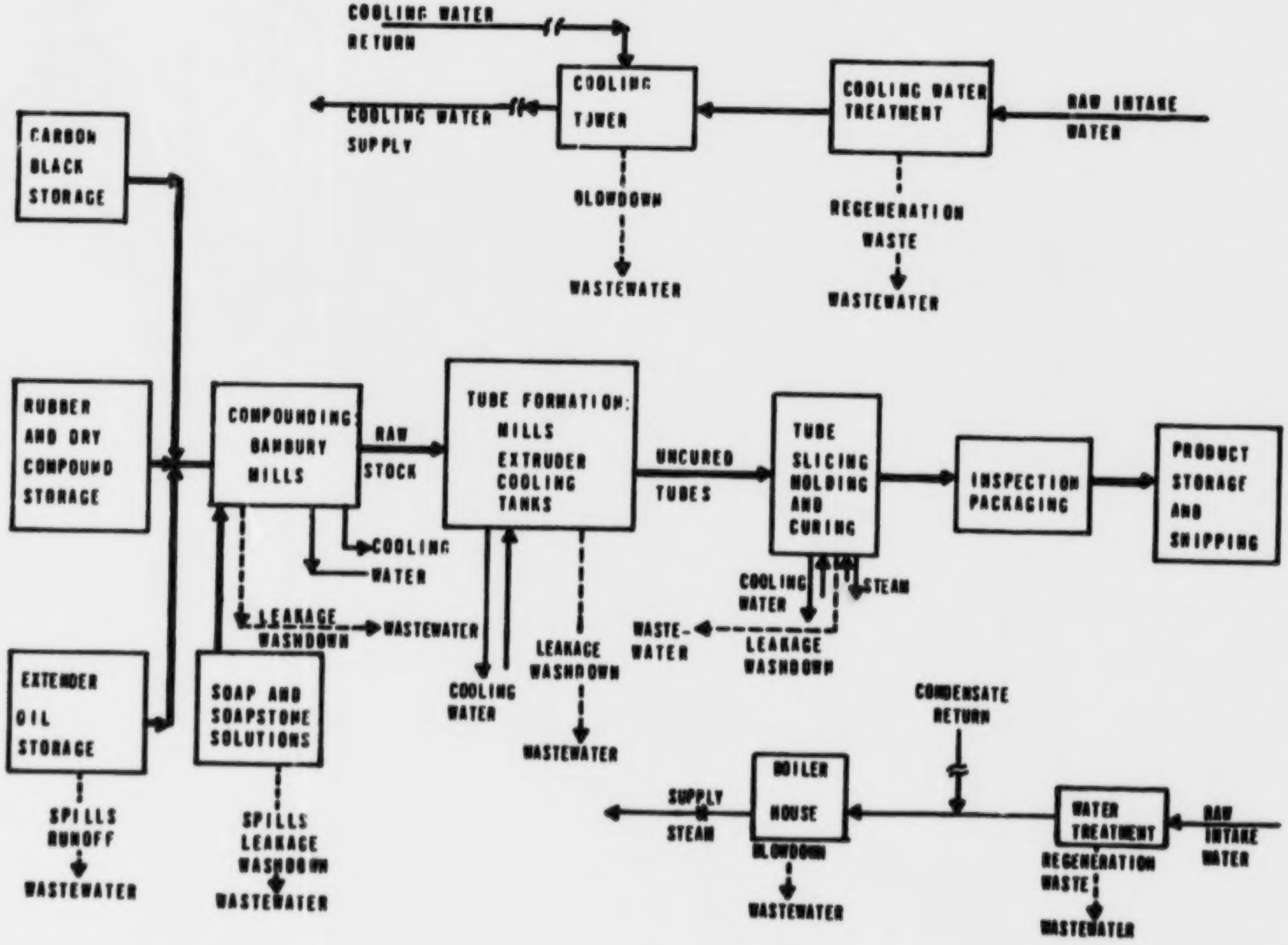


Figure B-1-2

FLOW DIAGRAM FOR A TYPICAL INNER TUBE PRODUCTION FACILITY



I.A.1.b Solid Wastes

The solid waste generation within the tire and tire products industry has been summarized as follows (Reference No. 2):

Type of Solid Waste	Pounds of Waste Per Million Pounds of Product Shipped
Paper, cardboard, and wood	13,400
Rubber compound	11,900
Textile material	5,900
Metal	9,700
Other	14,000

Paper-type solid waste is largely attributable to the packaging materials for carbon black, mineral segments, and other chemicals used in the process.

Rubber waste occurs at virtually all stages of the process, with the exception of fabric coating.

Textile and tire cord scrap (ends, clippings and defects) which have not been rubberized may be sold to scrap dealers for reuse in the mechanical rubber goods industry.

Metal waste is comprised largely of the high-carbon steel wire from the tire bead. This waste is generated by defective material in process waste trimmings. Scrap bead wire once was sold as scrap steel, but changes in the steel industry have eliminated this market.

The applicant should make an estimate of solid wastes for the proposed new source using a similar or more detailed method of categorization.

I.A.1.c Air Emissions

Primary air emissions attributable to the Tire and Inner Tube industry are those resulting from open burning, drying operations, and on-site utilities associated with the process.

The applicant should describe all air pollutant sources using a process flow diagram and any supplementary diagrams.

Specific attention, as a minimum, should be given to:

(1) Compounding of raw materials: Activated carbon used in this process becomes easily dispersed and creates a significant cleanliness problem. Baghouse control is common practice.

(2) Odor: Particularly from burning rubber scraps, which produces very acid and sulfurous gases in addition to obnoxious, sooty flame.

(3) Drying operations: Various organic solvents.

(4) Storage of organic chemicals: Vent valves, spillage, leaks.

(5) On-site utilities (Steam generation, heating): SO_x, NO_x, particulates, depending upon fuel source.

I.A.2 Other Impacts

I.A.2.a Raw Materials

Raw materials for tire and inner tube manufacture include rubber, carbon black, oils, chemicals, and segments which are transportable via existing rail heads, trucking, or barge systems.

For large new source facilities (those greater than about 20,000 units/day), careful analysis within the EIA should be given showing the method of raw material delivery and its associated environmental impacts, such as barge spillage or ballast discharge, tank-car cleaning, etc.

I.A.2.b Transportation

The EIA should show exactly what loading, unloading, transhipment, and other handling operations will be required for moving raw materials and products. For large plants, this analysis should include movement of material from point of origin to product distribution center. Raw materials and products in this industry segment are more readily dispersed than product materials, inasmuch as they are either liquids or dispersable solids.

I.A.2.c Site Preparation and Construction

This segment of the Rubber Processing Industry has no unique site preparation or construction impacts. The General Assessment Guideline (Chapter III) should be applied.

I.B Process Impact Control

I.B.1 Effluents

The applicant must discuss all in-process controls being incorporated in the proposed new source. Such discussion should cover as a minimum:

a. Soapstone discharge control systems: Recirculation systems have been imployed to eliminate continuous discharges of large soapstone quantities.

If recirculation systems are to be incorporated, the applicant must state what cleaning operations will be entailed and what discharges are likely to result.

b. Spills and leakages: Drip pans, curbs, collection sumps, etc., have been used to collect and segregate such wastes from process sewers.

The applicant should state how such leaks and spillages will be aboided or reduced, in addition to how they will be disposed of once collected.

c. Washdowns and machine cleaning: Special areas are commonly set aside for machinery cleaning and maintenance where solvents and steam are required.

The applicant must describe the facilities and procedures which will be incorporated in the new source in order to control the source of waste, including method of disposal.

d. Stormwater runoff: The applicant must describe how stormwater will affect the proposed facility and operations, giving special attention to loading and unloading operations, washdown areas, and oil storage areas.

Description of the methods by which stormwater runoff will be minimized or controlled should be specifically described, including as a minimum, consideration of diking, collection sumps, oil and water separation systems, and roofing.

e. Protective measures incorporated in design and maintenance programs which further reduce or control waste loads should be specifically described. For example, cooling water can be contaminated with process materials if heat exchangers are not periodically inspected for leaks and then repaired as necessary.

b. End-of-process treatment: The applicant should describe the end-of-pipe treatment system that will be employed.

I.B.2 Solid Waste Control Measures

The applicant must describe all measures which will be employed to reduce solid waste, being sure to include consideration of recycle and reuse options.

Of the various waste types, rubber compound and metal wastes are the most significant solid waste problems.

The applicant should specifically discuss how destructively-tested tires (a fraction of 1 percent al all produced) will be disposed of.

Open incineration is generally considered an unacceptable practice. Landfilling is currently practiced. Decreasing landfill capacity and increasing recognition of landfill impact upon the environment (ground water in particular) will limit the long-range suitability of the landfill solution.

Currently, small-scale reuse of old tires to artificial marine reef construction is being tested, with promising results.

I.B.3 Air Emissions

The applicant must describe all measures which will be incorporated in the facility design which will reduce air emissions.

Particular attention should be given to discussing how open burning of solid wastes will be eliminated, for example, by solid waste reuse or recycle, landfill disposal, or incineration by approved multi-chamber incinerators.

In addition, the applicant should give specific consideration to the use of:

a. Baghouses to control particulates generated in the compounding areas.

b. Wet or dry collection systems to control particulates generated in sidewall grinding areas, balancing machine areas, and tire repair areas.

c. Systems used to control particulate and solvent emissions generated in painting areas. Substitution of water-based paints has been attempted, but with limited success.

d. Oil/water separator enclosures.

I.C Alternatives

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of alternatives analysis. The responsible official should also be consulted to assume that there is no difference of opinion on the scope.

I.C.1. Site Alternatives

The Tire and Inner Tube segment of the Rubber Processing Industry has no unique environmental requirements affecting the site selection decisions.

The General Assessment Guideline should be followed.

I.C.2 Process Alternatives

Manufacturing process alternatives will be largely constrained by marketing considerations. Environmental impact considerations are not likely to affect process choice if in-process and reliable end-of-process techniques are employed.

I.C.3 Control Alternatives

In-process controls discussed previously should be incorporated in the project design, and, where determined unfeasible, reasons documenting other systems should be clearly stated. End-of-process control systems are important and must be well designed if new source standards are to be met and met continuously. No single control system is recommendable inasmuch as there is tremendous variability in new source size, integration with other industrial activities, and product mix. The applicant should provide description and documentation of the proposed control scheme to demonstrate such system adequacy and reliability.

APPENDIX B-1

II. SYNTHETIC RUBBER INDUSTRY

II. SYNTHETIC RUBBER INDUSTRY

II.A. Impact Identification

Impacts which must be described by the applicant are described herein.

II.A.1. Process Impacts

Using process flow diagrams, such as those provided in Figures B-1-3, B-1-4, and B-1-5, the applicant should describe all sources of process waste. The diagrams, which have been adapted from a water pollution survey report of this industry, show only wastewater sources (Reference No. 1). The diagram presented by the applicant should be comprehensive of all wastes.

Requirements for non-water wastes which the applicant should address in the EIA, as a minimum, are set forth in subsequent sections of the Appendix.

II.A.1.a. Process Effluents

(1) Effluents from Emulsion Processes (Crumb Production)

The applicant should discuss, as a minimum, the following wastewater sources:

- (a) Caustic Soda Scrubber Unit - spent caustic streams.
- (b) Monomer Recovery Unit - decant water.
- (c) Coagulation - coagulation liquor overflow.
- (d) Crumb Dewatering - crumb reuse overflow.
- (e) Monomer Strippers - stripper clean-out rinse water.
- (f) Tanks and reactors - clean-out rinse water.
- (g) Area washdowns.

Figure B-1-3

General Water Flow Diagram For An Emulsion Polymerized Crumb Rubber Production Facility

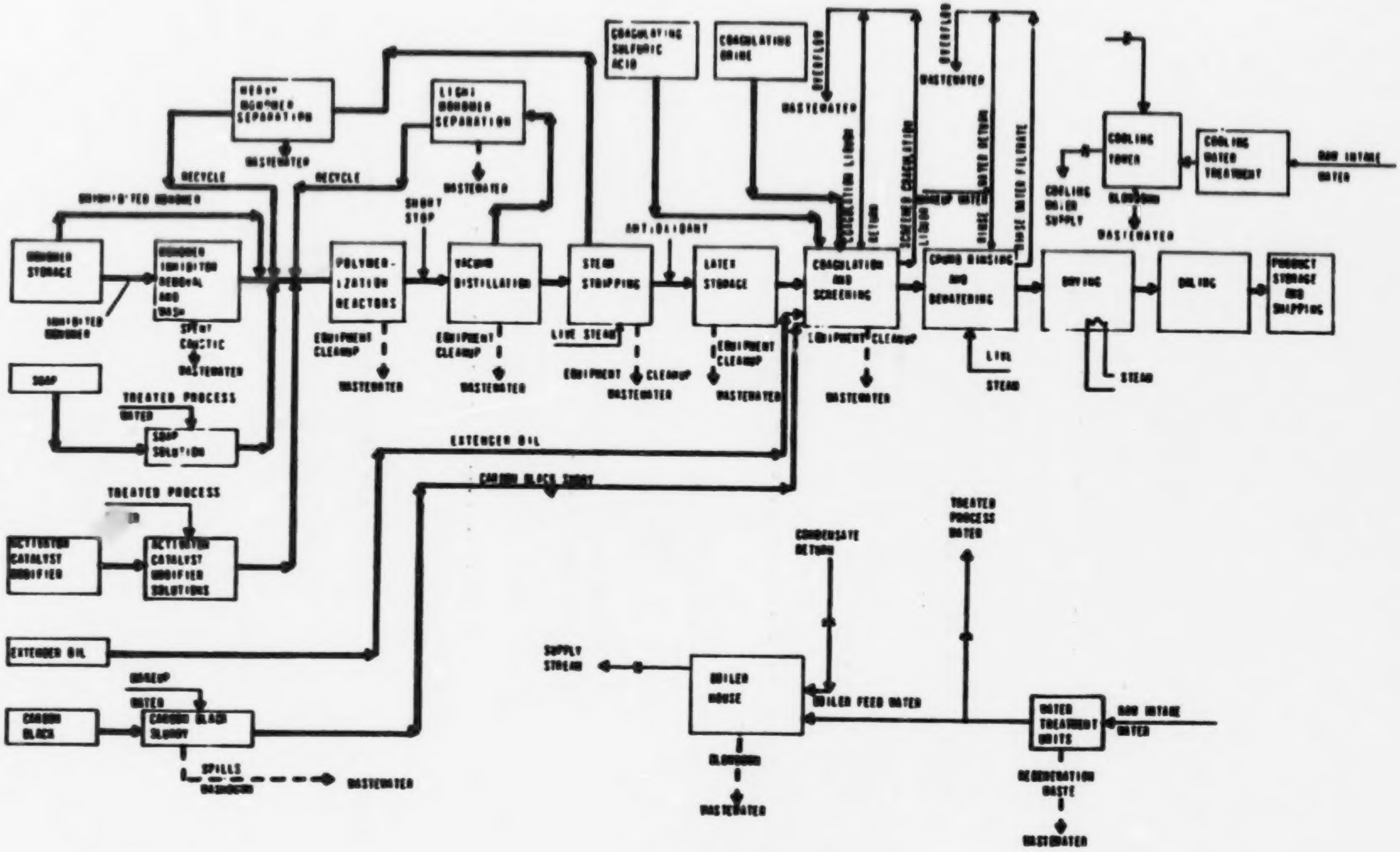


Figure B-1-4

General Water Flow Diagram For An Emulsion Latex Rubber Production Facility

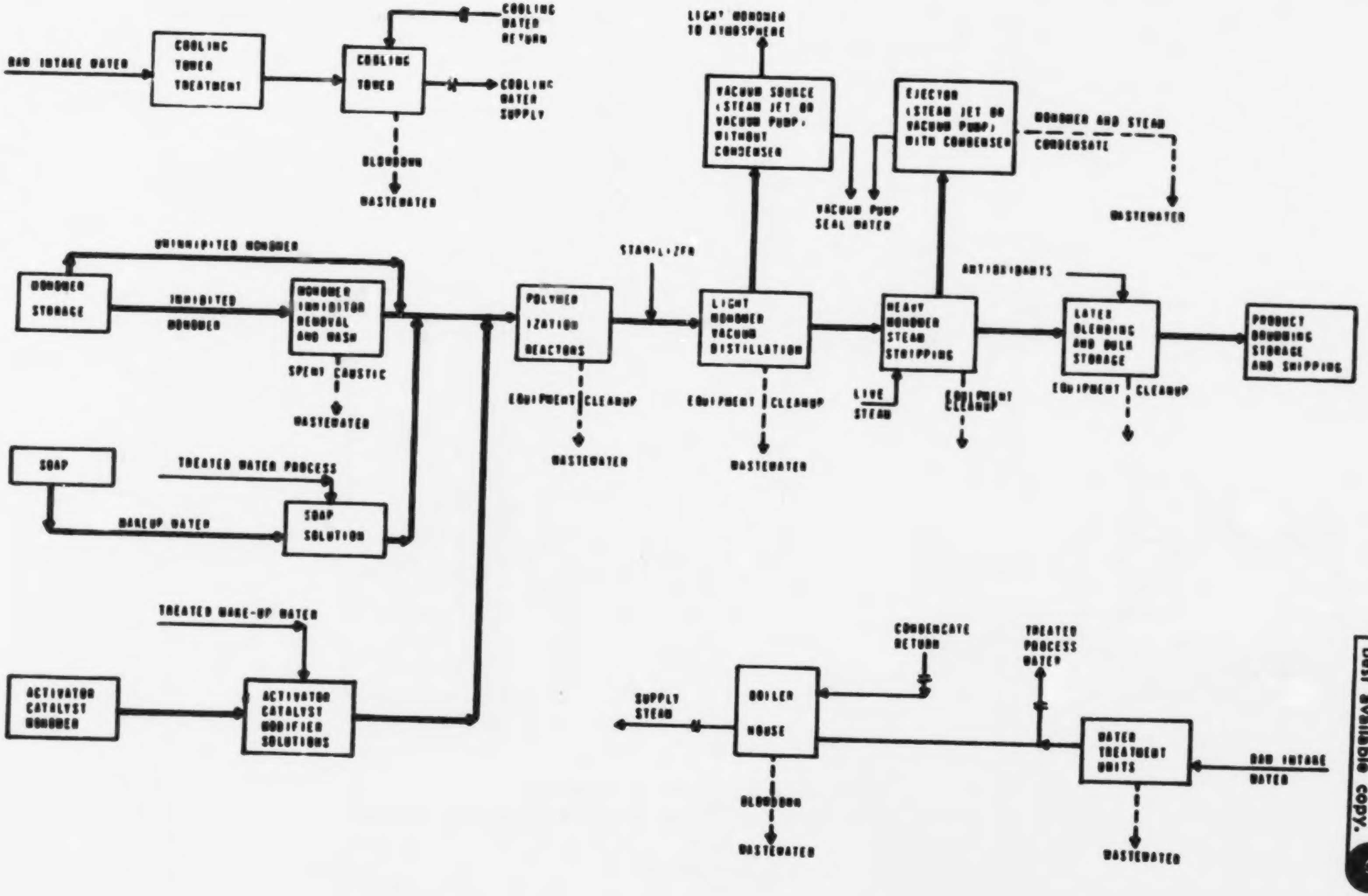


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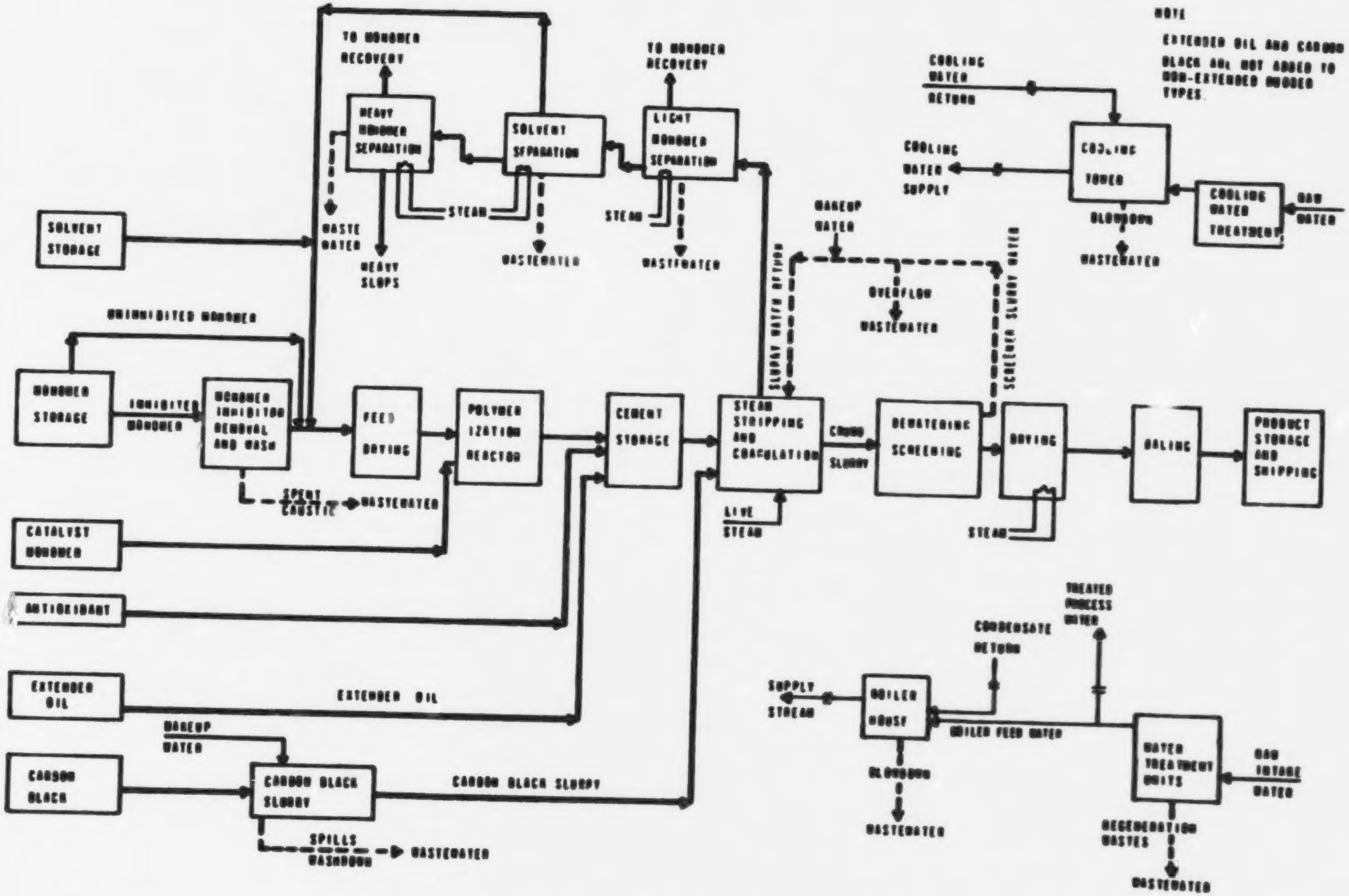
Figure B-1-5

General Water Flow Diagram For A Solution Polymerized Crumb Rubber Production Facility



(2) Effluents from Emulsion Latex Rubber Processes

The applicant should discuss as a minimum the following wastewater sources:

(a) Caustic Soda Scrubbers - spent caustic streams.

(b) Excess Monomer Stripping - decant water layer.

(c) Tanks, Reactors, and Strippers - clean out rinse water.

(d) Tank Cars and Tank Trucks - clean out rinse water.

(e) Area washdowns.

(3) Effluents from Solution Polymerization Processes

The applicant should discuss as a minimum the following wastewater sources:

(a) Caustic Soda Scrubbers - spent caustic stream.

(b) Solvent Purification - fractionator bottoms.

(c) Monomer Recovery - decant water layer.

(d) Crumb Dewatering - crumb rinse water overflow.

(e) Area washdowns.

II.A.1.b. Solid Wastes

Solid waste generation within the Synthetic Rubber segment of the Rubber Processing Industry has not been well-documented. Qualitatively, soapstone sludges and low-quality rubber products are probably the most important solid wastes.

The applicant should describe in detail all expected operations from which solid wastes will result. Explanation of how solid waste generation levels are optimized and what recovery or reuse options exist for minimizing waste disposal impacts must be made.

II.A.1.c. Air Emissions

Emissions from the Synthetic Rubber Manufacturing industry have been categorized as:

(1) Organic compounds emitted from reactor and blowdown tanks.
(2) Particulate matter and odors emitted from drying operations.

A more detailed breakdown of emission factors for this industry is presented in the following table.

Compound	Emissions	
	lb/ton	kg/MT
Alkenes		
Butadiene	40	20
Methylpropene	15	7.5
Butyne	3	1.5
Pentadiene	1	0.5
Alkanes		
Dimethylheptane	1	0.5
Pentane	2	1
Ethanonitrile	1	0.5
Carbonyls		
Acrylonitrile	17	8.5
Acrolein	3	1.5

II.A.2 Other Impact Sources

II.A.2.a Raw Materials

Raw materials for synthetic rubber manufacture are generally procured as output of other chemical manufacturing operations, and impacts associated with natural resource development are generally not a problem. Materials include: carbon black, solvent, soap, monomer, antioxidant, and extender oil. Consideration of induced impacts upon raw material supplying industries, however, will be required if the proposed synthetics plant:

(1) Is very large (larger than several 100,000 metric tons/year).

(2) Would require significant expansion of capacity in the supplying plant (expansion greater than about 25 percent).

II.A.2.b Transportation Impacts

The EIA should show exactly what loading, unloading, transhipment, and other handling operations will be required for moving raw materials and products. For large plants, this analysis should include movement of material from point of origin to product distribution center. Raw materials in this industry segment are more readily dispersed than product materials since they are liquids or solids and will have greater impact when spilled.

Possible spillage impacts include:

(1) Massive particulate (soot) pollution by carbon black.
(2) Toxicity to living organisms (land and water and environments).
(3) Fire and severe property damage.

II.A.2.c Site Preparation and Construction

This segment of the Rubber Processing Industry has no unique site preparation or construction impacts. The General Assessment Guideline (Chapter III) should be applied.

II.B Process Impact Control

II.B.1 Effluent Controls

The applicant should discuss all in-process waste controls which will be incorporated in the proposed new source. These discussions should cover (as a minimum) in-process controls for:

a. Crumb rinse overflow elimination systems.
b. Coagulation liquor overflow controls.

c. Elimination of steam-drive vacuum systems.
d. Equalization of spent scrubber solutions.
e. Carbon black slurrying systems.
f. Latex spill control.

End-of-process treatment systems should also be discussed, giving particular attention to the following:

a. Primary clarification of fine rubber solids.
b. Latex coagulation and use of clay or limestone as settling aids.
c. Collection, dewatering, and disposal of surface (floating) solids.
d. Nutrient addition to achieve biodegradation.
e. Secondary clarification.
f. Tertiary treatment units, such as activated carbon.

II.C. Alternatives

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of the alternatives analysis. The responsible official should also be consulted to assure that there is no difference of opinion on the scope.

II.C.1 Site Alternatives

The Synthetic Rubber segment of the Rubber Processing Industry has no unique environmental requirements affecting the site selection decision. The General Assessment Guideline should be followed in analyzing alternative sites.

II.C.2 Process Alternatives

Overall process choice will be controlled by the product market being pursued. Economically-stimulated trends towards radial tires, which require more natural rubber in tire manufacture, may reduce the pollution levels.

II.C.3 Control Alternatives

In-process control techniques discussed in paragraph "B" of this appendix should all be as minimum levels of in-process control, with specific explanation of justification of why any particular method is unsuitable (excessive cost, better control system availability, lack of reliability, etc.).

End-of-process control systems are important and must be well designed if new source standards are to be met and met continuously. No single control system, however, is recommendable inasmuch as tremendous variability in new source size, product mix, and raw materials will control the ultimate control system chosen. The applicant should provide description and documentation of the proposed control system, to demonstrate that system's adequacy and reliability.

APPENDIX B-1

III. MOLDED, EXTRUDED, AND FABRICATED RUBBER PRODUCTS INDUSTRY

III. MOLDED, EXTRUDED, AND FABRICATED RUBBER PRODUCTS INDUSTRY

III.A Impact Identification

Impacts which must be described by the applicant are described herein.

III.A.1 Process Impacts

Using a process flow diagram such as that provided in Figure B-1-6, the applicant should describe all sources of process waste. The diagram presented in this figure has been developed from a water pollution survey of the industry and thus is not complete regarding air and solid waste sources.

III.A.1.a Effluents

All effluents must be identified and evaluated. In particular, the applicant should give special attention to spills and leaks, washdowns, discharges from air pollution equipment, and rinse waters.

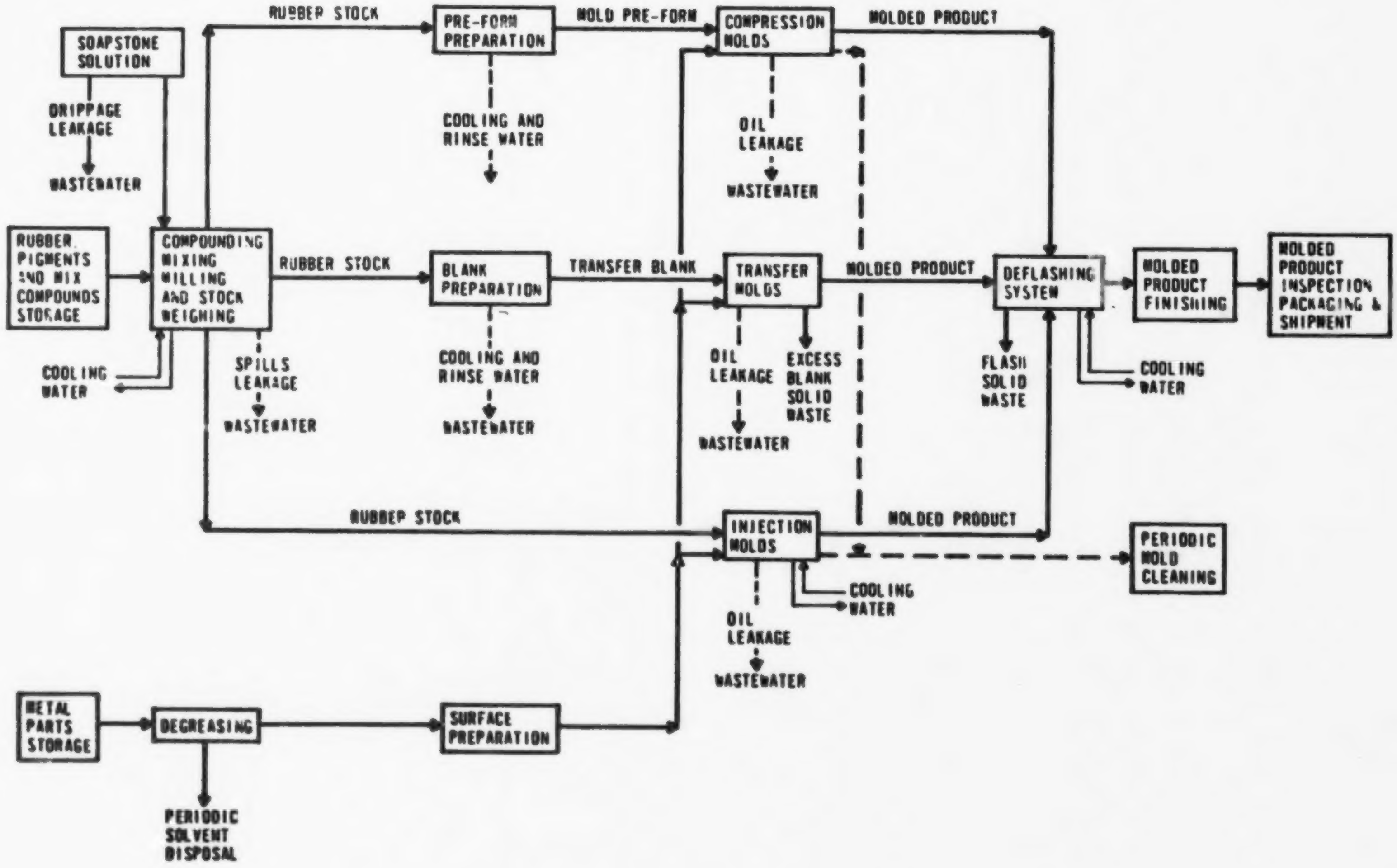
III.A.1.b Solid Wastes

Data relating solid waste generation levels for this industry segment is provided as follows:

Rubber Footwear	Millions of Pounds Per Million Pounds of Product
Paper, cardboard, wood	17,000
Rubber compound	90,000
Textile	66,000
Metal	1,000
Other	35,000
Belts	
Paper, cardboard, wood	27,300
Rubber compound	41,000
Textile	25,200
Metal	2,300
Other	30,200
Hose	
Paper, cardboard, wood	33,000
Rubber compound	54,700
Textile	18,300
Metal	10,200
Other	49,300

Figure B-1-6

Flow Diagram for the Production of a Typical Molded Item



III.A.1.c Air Emissions

Air emissions for this industry segment are those resulting from compounding, drying, and on-site utilities associated with the process (e.g., steam generation, cooling water evaporation).

The applicant should describe all such air emission sources, using the process diagram and any supplementary diagrams.

Specific attention, as a minimum, should be given to:

(1) Compounding of raw materials: Activated carbon used in this process may become easily dispersed.

(2) Odor.

(3) Drying and curing operations which drive off organic solvents.

(4) Storage of organic solvents.

(5) On-site utilities (Steam generation and heating - SO_x, NO_x, particulates).

III.A.2 Other Impacts

III.A.2.a Raw Materials

Raw materials are generally procured as output of other chemical manufacturing operations, and impacts associated with resource development will not be a problem. Consideration of induced impacts upon raw material in supplying industries is not required.

III.A.2.b Transportation Impacts

The EIA should show exactly what loading, unloading, transhipment, and other handling operations will be required for moving materials and products.

III.A.2.c Site Preparation and Construction

This segment of the Rubber Processing Industry has no unique site preparation or construction impacts. The General Assessment Guideline should be applied.

III.B Process Impact Control

The following in-process controls must be addressed, as a minimum:

(1) General spills and leaks - segregated collection and treatment systems for oily and greasy waste wastewaters, soapstone, and anti-tack dip solutions.

(2) Spills at storage and loading facilities - collection and treatment systems.

(3) Storage drum cleaning and rinsing areas.

(4) Solvent and cement-mixing areas - preventative measures for keeping these materials from entering plant process sewers.

(5) Closed-system degreasing units employed in metal preparation.

(6) Pretreatment of acid pickling solutions to remove metallic components and adjust pH.

(7) Dry and wet scrubbing devices used in rubber compounding and buffing areas.

End-of-pipe treatment should also be described. Special attention should be given to oil, grease, and suspended solids.

III.C Alternatives

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of the alternatives analysis. The responsible official should also be consulted to assure that there is no difference of opinion on the scope.

III.C.1 Site Alternatives

The Molded, Extruded, and Fabricated Products segment of the Rubber Processing Industry has no unique environmental requirements or considerations affecting the site selection decision. The General Assessment Guideline should be followed in analyzing alternative sites.

III.C.2 Process Alternatives

Process alternatives are not a great determinant of waste load or impact in this segment of the industry and need not be, as long as full control of waste generation by means of identified in-process controls (Subsection III.B.2.a) is implemented.

III.C.3 Control Alternatives

Full evaluation should be given to incorporating all in-process controls identified in Subsection III.B.2.a, with special emphasis on the feasibility of dry-type pollution devices to collect metal fines from sand-blasting and other grinding operations.

APPENDIX B-1

IV. RECLAIMED RUBBER INDUSTRY

IV. RECLAIMED RUBBER INDUSTRY

IV.A Impact Identification

Impacts which must be described by the applicant are described herein.

IV.A.1 Process Impacts

All process wastes should be described and identified by a suitable process flow diagram.

IV.A.1.a Effluents

Effluents which the applicant should address are summarized in Table B-1-1.

IV.A.1.b Solid Wastes

Since this segment of the Rubber Processing Industry normally utilizes waste as raw material, any solid wastes resulting from this industry segment cannot be converted into a reuseable product (by existing technology).

The following estimated solid waste generation characteristics are noted for the three basic reclaiming processes:

Wet Digester Process	0.6 lbs rubber waste/100 lbs 25.3 lbs other waste/100 lbs
Pan (or Dry Process)	1.9 lbs rubber waste/100 lbs 2.4 lbs other waste/100 lbs
Mechanical	1.0 lbs rubber waste/100 lbs 0.4 lbs other waste/100 lbs

"Other" wastes are waste paper, wire shopping, broken pallets, and testing scrap.

The applicant should identify and estimate the solid wastes to be generated by the proposed new source.

IV.A.1.c Air Emissions

Air emission sources should be identified and described by the applicant with particular attention being given to the following:

(1) Vapor vents on devulcanizers and blowdown tanks.
(2) Compounding mixers.
(3) Devulcanized rubber dryers.
(4) Line grinding operations.
(5) Process-associated utilities (cooling water, steam).
(6) Depolymerization and defibering agent storage areas.

Table B-1-1

Process-Associated Waste Water Sources from Rubber Reclaiming

Plant Unit or Area	Source	Nature and Origin of Waste Water Contaminants
Wet Digester Reclaim Process		
Grinding	Washdown, spills, leaks	Bearing oil from machine drives. Oil from seals on milling equipment.
Depolymerization, Defibering and Oil Storage	Spills, runoff	Oil, solids, caustic and organics.
Blowdown Tank	Air pollution equipment	Oils and organics.
Dewatering	Digester liquor	Oil, solids, caustic and organics from spent depolymerization and defibering agents and excess oil. High concentrations of fibrous material removed from tires.
Dryers	Air pollution equipment	Oils and organics.
Compounding	Washdown, spills, leaks, air pollution equipment	Bearing oil from machine drives. Oils from seals on milling equipment. Solids from soapstone dip tanks. Solids from air pollution equipment.
Pan (Heater) Reclaim Process		
Grinding	Washdown, spills, leaks	Bearing oil from machine drives. Oil from seals on milling equipment.
Depolymerization Agent and Oil Storage	Spills, runoff	Oil, solids, caustic and organics.
Devulcanizer	Air pollution equipment	Oil and organics.
Compounding	Washdown, spills, leaks, air pollution equipment	Bearing oil from machine drives. Oils from seals on milling equipment. Solids from soapstone dip tanks. Solids from air pollution equipment.

IV.B Process Impact Control

IV.B.1 Effluents

All recycle and reuse measures which will be employed should be described.

Leak and spillage containment procedures and devices should also be described.

Vacuum systems not utilizing steam should be evaluated and discussed.

Surface condensers (heat exchangers) should be considered for use in lieu of barometric condensers.

Specific discussion of scrap rubber defibering methods should be given, with consideration given to pollution caused by use of defibering chemicals.

End-of-pipe treatment systems should also be fully described. If process wastes will be sent to municipal treatment plants, the applicant should discuss the capability of the municipal treatment system to adequately handle the process wastewaters.

IV.C. Alternatives

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of the alternatives analysis. The responsible official should also be consulted to assure that there is no difference of opinion on the scope.

IV.C.1 Site Alternatives

No special environmental requirements or considerations affecting site selection within this segment of the Rubber Processing Industry are noted.

IV.C.2 Process Alternatives

The conversion of a wet digestion reclaiming plant to any of the three dry reclaiming processes (pan, mechanical, or dry digestion), in order to improve the quality of the plant's effluent would effect considerable reduction of waste load.

IV.C.3 Control Alternatives

As an alternative to chemical defibering, defibering by mechanical or physical techniques can be used. In brief, the wastewater benefits of this method are: fiberfree dewatering liquor, no chemical defibering agents in the liquor, and reduced dewatering liquor discharge due to liquor recycle. In cases where liquor recycle can be utilized, the usage of process oils and digestion chemicals is also significantly reduced.

APPENDIX B-1

V. LATEX-BASED GOODS

V. LATEX-BASED GOODS

V.A Impact Identification

V.A.1 Process Impacts

All impacts should be described by means of a suitable process flow diagram.

V.A.2 Other Impacts

Impacts associated with closely associated process facilities, such as loading, storage, preparation, and shipping facilities, should be fully developed per the General Assessment Guideline.

V.B Process Impact Control

All process waste and other impact controls should be described per the General Assessment Guideline.

V.C Alternatives

No special alternatives analysis procedure is noted. The General Assessment Guideline should be followed.

REFERENCES

1. Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Rubber Processing Industry. U.S. EPA, 1973.

2. Rubber Reuse and Solid Waste Management, Part I, Solid Waste Series (SW-22c), U.S. EPA.

3. An Economic Analysis of the Control of Sulfur Oxides Air Pollution. (NTIS No. PB-227-099/9) HEW, 1967.

4. Air Pollution from Fuel Combustion in Stationary Sources. (NTIS No. PB-222-341/0), EPA-R2-73-241.

5. Fluidized-Bed Incineration of Selected Carbonaceous Industrial Wastes. (NTIS No. PB 211-161).

6. Flue Gases - Exhaust Gases from Combustion and Industrial Processes. (NTIS No. PB 204-861).

7. Control Techniques for Hydrocarbon and Organic Solvent Emissions from Stationary Sources. (NTIS No. PB 190-266). Batelle Memorial Institute, 1970.

8. Compilation of Air Pollutant Emission Factors (2nd Ed.) U.S. EPA, April 1973, (NTIS No. 223-996) AP-42.

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APPENDIX B-2

PETROLEUM REFINING INDUSTRY

Introduction

This Appendix supplements, for the Petroleum Refining industry, the instructions provided in the General Assessment Guideline. The applicant should discuss in the EIA all relevant impacts discussed in the following sections. The material in the EIA should be in the format described in the General Assessment Guideline.

I. IMPACT IDENTIFICATION

I.A Process Waste Impacts

All process wastes shall be identified by means of a suitable flow diagram which designates each waste source.

I.A.1 Effluents

Effluents which require special consideration are listed herein:

a. Storage and Transportation:

   (1) Oil, water, and sludges from storage tank bottoms.
   (2) Tank cleaning operations.
   (3) Leakage, spillage.
   (4) Salt filters.
   (5) Intermediate product storage - wastewater from tank bottoms.
   (6) Finished product storage.
   (7) Ballast waters from tankers.

b. Crude Desalting: Desalter wastewaters.

c. Crude Oil Fractionation:

   (1) Wastewater from overhead accumulators.
   (2) Oil sampling lines.
   (3) Barometric condensers.

d. Cracking:

   (1) Overhead accumulator wastewater (thermal cracking).

   (2) Wastewaters from steam strippers and overhead accumulators on fractionators (catalytic).

e. Hydrocarbon Rebuilding:

   (1) Polymerization wastewater.

   (2) Alkylation wastewater streams resulting from the neutralization of hydrocarbon streams leaving the sulfuric acid alkylation reactor.

   (3) Overhead accumulator wastewater.

   (4) Hydrofluoric acid alkylation rerun unit wastewaters.

f. Hydrocarbon Rearrangements. Wastewater resulting from the overhead accumulator.

g. Solvent Refining. Fractionation towers bottoms.

h. Hydrotreating. Hydrotreating unit wastewaters.

i. Grease Manufacturing. Grease manufacturing unit wastewaters.

j. Asphalt Production. Wastewaters from asphalt-blowing operations.

k. Product Finishing.

   (1) Drying and sweetening operations.

   (2) Lubricating oil finishing wastes (acid-bearing wastes, rinse waters, sludges and discharges resulting from acid treatment of lubricating oils).

   (3) Blending and finishing operations.

   (4) Washing of railroad tank cars or tankers prior to loading.

   (5) Tetraethyl lead additives appearing as pollutants in sludges from storage tanks (see Reference No. 1).

l. Auxiliary Activities

   (1) Hydrogen manufacture process wastes.

   (2) Utilities functions (steam and cooling water systems).

   (3) Blowdowns from closed-loop recirculating systems.

I.A.2 Solid Wastes

Solid wastes generated at a refinery include a variety of process sludges, spent catalysts, scrap materials, and sediments. The applicant must show all sources of solid waste by means of suitable flow diagram, and verbally describe all waste characteristics. Quantitative estimates shall be made.

One proposed 250,000-bpd topping refinery had a predicted solid waste production of roughly 50 tons per week. Of this amount, 35 tons per week were to be disposed of at the local municipal landfill, and 15 tons per week were spent catalyst, which was to be returned to the manufacturer for reprocessing.

Refinery solid waste can be categorized into three general types: 1) process solids from refinery operations; 2) solids generated from effluent treatment processes; and 3) wastes associated with general plant activities. Tables B-2-1, B-2-2, and B-2-3 summarize sources and characteristics of each general type of waste (see Reference No. 1).

Comprehensive surveys of solid waste generation rates for petroleum refineries are currently being conducted by the EPA office of Solid Waste Management Programs. Results are scheduled for publication in late 1975.

I.A.3 Air Emissions

The applicant is required to present a thorough identification, description, and estimation of all air emissions generated by the new source. Particular attention must be paid to fugitive emissions and their sources. Ancillary facilities, such as docks, transhipment facilities, storage areas, and distribution facilities shall be considered part of the new source.

I.A.3.a Emission Source Summary

A summary of important air emission sources is presented below:

(1) Storage tanks.
(2) Catalyst regeneration units.
(3) Pipeline valves and flanges.
(4) Pressure relief valves.
(5) Pumps and compressers.
(6) Compresser engines.
(7) Cooling towers.
(8) Loading facilities.
(9) Wastewater separators and process drains.
(10) Blowdown systems.
(11) Pipeline blind-flange changing.
(12) Boilers and process heaters.
(13) Vacuum jets.
(14) Sampling.
(15) Air blowing.
(16) Acid treating.

Supplementary data which the applicant should consider in preparing the EIA are presented herein.

Table B-2-1

Sources and Characteristics of Refinery Solid Waste

Type of Waste	Sources	Description	Characteristics
Process Solids	Crude oil storage, desalter	Basic sediment and water	Iron rust, iron sulfides, clay, sand, water, oil
	Catalytic cracking	Catalyst fines	Inert solids, catalyst particles, carbon
	Coker	Coker fines	Carbon particles, hydrocarbons
	Alkylation	Spent sludges	Calcium flouride, bauxite, aluminum chloride
	Lube oil treatment	Spent clay sludges, press dumps	Clay, acid sludges, oil
	Drying and sweetening	Copper sweetening residues	Copper compounds, sulfides, hydrocarbons
	Storage tanks	Tank bottoms	Oil, water, solids
	Slop oil treatment	Precoat vacuum filter sludges	Oil, diatomaceous earth, solids
Effluent Treatment Solids	API separator	Separator sludge	Oil, sand, and various process solids
	Chemical treatment	Flocculant aided precipitates	Aluminum or ferric hydroxides, calcium carbonate
	Air flotation	Scums or froth	Oil, solids, flocculants (if used)
	Biological treatment	Waste sludges	Water, biological solids, inerts
General Waste	Water treatment plant	Water treatment sludges	Calcium carbonate, alumina, ferric oxide, silica
	Office	Waste paper	Paper, cardboard
	Cafeteria	Food wastes (garbage)	Putrescible matter, paper
	Shipping and receiving	Packaging materials, strapping pallets, cartons, returned products, cans, drums	Paper, wood, some metal, wire
	Boiler plant	Ashes, dust	Inert solids
	Laboratory	Used samples, bottles, cans	Glass, metals, waste products
	Plant expansion	Construction and demolition	Dirt, building materials, insulation, scrap metal
	Maintenance	General refuse	Insulation, dirt, scrapped materials - valves, hoses, pipe

Table B-2-2

Characteristics of Refinery Solid Wastes

(All values are percentages and approximate)

Waste Type	Oil or Hydrocarbon	Water	Volatile Solids	Inert Solids	Characteristics
API Separator Sludge	15	66	6	13	Fluid slurry of oil, water, and sand
Tank Bottoms	48	40	4	8	Oil-water mixture
Chemical Treatment Sludge	5	90	-	5	Slightly viscous fluid
Air Flotation Froth	22	75	-	3	Thick, oily fluid
Precoat Vaccum Filter Sludges	22	29	-	49	Stiff material, semi-solid at ambient temperatures.
Biological Treatment Sludges					
Raw	0	98	1.5	0.5	Water consistency
Mechanically Thickened	0	94	4	2	Thick, but pumpable
Centrifuged	0	85	10	5	Viscous - peanut butter consistency
Vacuum filtered	0	75	15	10	Wet, crumbly solid
Screw pressed	0	40	40	20	Intact, solid cake
Water Treatment Sludge	0	95	-	5	Pumpable fluid, sometimes gelatinous

Table B-2-3

Estimated Refinery Solid Waste Quantities

Waste Types	Unit Loads	Factors	Quantities lbs/day
API Separator Sludges	200 mg/L Suspended Solids	5.0 mgd	8,320
Chemical Treatment (API Separator Effluent)	50 mg/L Suspended Solids removed only	5.0 mgd	2,080 (dry solids)
Biological Sludges	0.7 lbs. dry solids per lb. BOD removed	4,500 lbs/BOD_5/day	3,150
Water Treatment Sludge			
a. Lime Soda Ash	2 parts dry sludge per 1 part hardness removed	200 ppm hardness removed	16,700 (dry solids)
b. Ion exchange	0.4 lbs. salt per 1,000 grains hardness	200 ppm hardness removed	560 (dry salt)
Office wastes	1.0 cu. yd. per employee/month	120 employees	1,200
Cafeteria	0.6 lbs per meal	100 meals/day	60

I.A.3.b Petroleum Storage Emissions

A major source of air emissions has been the fixed roof storage and the "working losses" associated with changes in liquid level within the tank. Floating-roof tanks are considered more desirable for new source projects. A comparison of emission factors for these two tank varieties is presented in Table B-2-4.

I.A.3.c Crude Oil Separation Emissions

A compilation of emission factors for crude oil separation units is presented in Table B-2-5.

I.A.3.d Catalyst Regenerator Unit Emissions

Emission factors for catalyst regeneration units are presented in Table B-2-6.

I.A.3.e Claus Sulfur Recovery Unit Emissions

The applicant should describe the Claus sulfur recovery unit associated with the proposed new source petroleum refinery, and should pay particular attention to tail-gas air emissions. If Beavon or similar units are used to improve sulfur removal efficiencies, these should also be described.

Further data regarding Claus Plant Emissions are presented (see References).

I.A.3.f Economic Factors Associated with Air Pollution Control

Data regarding the economic impact of air quality standards upon the petroleum refining industry have been reported (see References).

Table B-2-4

Hydrocarbon Emission Factors For Evaporation Losses From The Storage Of Petroleum Products (Ref. 65)

Type of Tank	Units	Type of Material Stored: Gasoline or Finished Petroleum Product	Type of Material Stored: Crude Oil
Fixed roof			
Breathing loss	lb/day-1,000 gal storage capacity	0.4	0.3
	kg/day-1,000 liters storage capacity	0.05	0.04
Working loss	lb/1,000 gal throughput	11	8
	kg/1,000 liters throughput	1.32	0.96
Floating roof			
Breathing loss	lb/day-tank	140(40 to 210)	100(30 to 160)
	kg/day-tank	63.5	45.4
Working loss	lb/1,000 gal throughput	Negative	Negative
	kg/1,000 liters throughput	Negative	Negative

Table B-2-5

Pollutants From Crude-Oil Separation units
(Ref. 65)

Source	Pollutant	Emission Factor lb/1,000 cu ft	Emission Factor lb/1,000 bbl oil
Combustion	Sulfur Oxides	Negative	8400 x %S
Process heaters	Hydrocarbons	0.03	140
Boilers	Particulates	0.02	800
	Carbon monoxide	-	2
	Nitrogen oxides	0.02	2900
Barometric condensers	Hydrocarbons	-	130 lb/1,000 bbl charge to vacuum distillation tower
	Odors	-	Odors caused by noncondensables and light hydrocarbons
Miscellaneous: Sampling, spillage, leaks, drains, and blowdown	Hydrocarbons	-	150 lb/1,000 bbl crude

Table B-2-6

Emission Factors for Pollutants From Catalyst Regenerator

(Ref. 65)

Pollutant	Source	Emission Factor (lb/1,000 bbl charge)
Sulfur dioxide	Regenerator	500
Particulates	Regenerator (with precipitator)	61
Hydrocarbons	Regenerator	220
Carbon monoxide	Regenerator	13,700
Nitrogen oxides	Regenerator	63

I.B Other Impacts

I.B.1 Raw Materials Extraction and Transportation

The Environmental Impact Assessment must include examination of the extraction, transportation,and handling of crude oil raw materials as part of the refining impact assessment, as elaborated below.

The proposed refinery may be variously comprised of such important facilities as deepwater ports, submerged pipelines, marine terminals, overland pipelines, bulk storage areas, loading areas, etc.

Such facilities must be fully encompassed and analyzed in the EIA whenever:

a. Facilities are (or will be) substantially owned by the proposed refinery or its affiliated companies.

b. Facilities will be constructed or expanded largely through the revenues paid by the proposed refinery.

Degree of detail which must be given to impact investigations for these facilities shall be directly proportional to the degree to which such facilities are directly owned, operated, or supported by the proposed refinery. In cases where the proposed refinery will construct its own marine facility, or deepwater port, for example, such facility shall be investigated with the same level of detail as that for the refinery itself. This requirement will apply in cases where a substantial portion of the deepwater port or marine facility would be leased to other industry. If, however, the port facilities are being expanded to meet the new refinery demands by some independent or non-affiliated party, the degree of detail may be much less.

The discretion of the EPA Regional Administrator shall govern the final detail requirements.

I.B.2 Marine Terminal and Deepwater Port Facilities

In cases where new or expanded marine terminal and deepwater facilities are involved in the new source proposal, the applicant shall ensure that the following considerations are covered,as a minimum:

a. Location in relation to railways, major access roads, towns, and major commercial and residential areas.

b. Visual character.

c. Land Ownership.

d. Easements, encumbrances.

e. Local and regional land use.

f. Sewer, electrical, water supply, and other services.

g. Description of the pier structure.

h. Piping and its design basis (pipelines for crude, product, fire water).

i. Storage tanks (slop, foam, etc.).

j. Cathodic protection systems.

k. Lighting.

If dredging will be required, the applicant must discuss, as a minimum:

a. Psysiography.

b. Dredging methods.

c. Estimated volume to be dredged.

d. Disposal options (inshore embayments, deepwater disposal).

e. Biota which will be affected.

f. Sediment consolidation.

g. Recolonization of biota.

h. Disposal site hydrography.

Tanker casualties must also be discussed. Data showing the frequency of tanker casualties worldwide are provided in Table B-2-7.

Table B-2-7

Types and Magnitude of Tanker Casualties Worldwide[1]

Type of Casualty	Percent of Polluting Incidents	Percent of Pollution Resulting
Structural Failures	19	49
Groundings	26	29
Collisions	31	8
Explosions	6	8
Rammings	8	1
Fires	7	1
Breakdowns and Other	2	4

Range-Barrels	Percent of Incidents	Percent of Total Oil Released
1 to 1,000	63.47	5.75
1,001 to 3,500	22.37	11.29
3,501 to 20,000	10.05	16.07
20,001 to 100,000	3.65	37.74
100,000	0.46	29.15

References describing the impacts of oil upon marine life are presented in the reference section.

I.B.3 Overland Pipelines

In cases where overland pipelines are involved, the applicant shall ensure that the following considerations are covered as a minimum:

a. Location, in relation to major transportation networks, residential and commercial areas, water crossings, lowlands, wildlife habitat, parks.

b. Land ownership.

c. Easements, encumbrances.

d. Leak detection systems.

e. Emergency shut-down procedures.

f. Oil spill contingency plans.

g. Disruptions to traffic and property caused by construction.

h. Erosion and sedimentation controls.

i. Pipeline design life.

I.C Summary of Impact Sources

Table B-2-8 summarizes impact sources for the Refining Industry. Data presented in Table B-2-8 are approximate and represent best estimates based upon current knowledge. The applicant should in all cases estimate corresponding values for the proposed new source and clearly explain the rationale behind such estimates.

Table B-2-8

Major Impact Sources and/Quantities[1]

	BOD lbs/1000 BBL	COD lbs/1000 BBL	Particulates lbs/1000 BBL	NOX lbs/1000 BBL	SOX lbs/1000 BBL	Hydrocarbons lbs/1000 BBL	Solids lbs/1000 BBL
TRANSPORT: (CRUDE & PRODUCT)							
Pipeline	-	-	1.9	55	4.0	5.5	-
Tankers	-	-	0.4	38	5.8	0.2	-
Supertankers	-	-	0.42	38	5.8	0.2	-
Barges	-	-	34	24	26	16	-
Tank Trucks	-	-	7	210	15	21	-
Tank Cars	-	-	14	43	37	29	-
Processing							
Crude Desalting	1	-	0	0	0	0	0
Crude Fractionation	.2	5	2.3	27	.1	34	-
Cracking	15	18	17	102	300	44	48
Hydrocarbon rebuilding	12	142	7	112	.1	77	-
Hydrocarbon rearrangement	-	40	5	144	.05	34	-
Solvent Refining	-	-	-	-	-	90	-
Hydrotreating	95	100	5	50	-	120	-
Grease Mfg.	-	-	-	-	-	23	-
Asphalt Production	-	32	6	70	0.2	35	-
Storage							
Crude	1	-	0	0	0	62	-
Product	-	-	-	-	-	21	-

[1] Environmental Impacts, Efficiency and Cost of Energy Supply and End Use. Vol. I Final Report. Hittman Associates. Prepared for the Council on Environmental Quality, the National Science Foundation RANN Program, and the Environmental Protection Agency. Not Yet Published.

II. POLLUTION CONTROL

II.A In-Process Controls on Effluents

II.A.1 Reuse of Water

The applicant should discuss all water reuse measures, including the following, as a minimum:

a. Reuse of sour waters from catalytic cracker accumulators for makeup to crude desalters.

b. Reuse of high-pressure boiler condensate blowdown as makeup to low-pressure boilers.

c. Reuse of treated effluent water wherever possible (routine washing operations, fire mains, cooling systems).

d. Reuse of contaminated condensate for regeneration of steam which will be used for process contact operations.

e. Use of stormwater retention ponds for fire water, or other low-quality uses.

f. Use of cooling tower blowdowns as seal water on high-temperature pump service where mechanical seals are impractical.

II.A.2 Recycle Water (reuse of water more than once for same purpose)

The applicant should discuss all water recycle measures, including the following, as a minimum:

a. Recirculation of steam condensate as boiler feedwater (commonly practiced for medium- and high-pressure systems, not always for low-pressure steam).

b. Recirculation of cooling water (in lieu of once-through water).

II.A.3 Housekeeping

The applicant should discuss what good housekeeping measures have been incorporated in the proposed new source, including consideration of the following:

a. Minimizing waste from sampling stations.

b. Use of vacuum trucks (or other non-aqueous methods) for cleaning up oil spills (thereby permitting recovery of hydrocarbons).

c. Preventive maintenance program to reduce leaks (pump seals, valve stems, etc.).

d. Segregation of process wastes and other specialized wastes which are better treated individually as low-flow, highly-concentrated streams.

e. Curbing process units so that spills, washes, and oily stormwater runoff can be collected separately and recycled and/or treated specially.

f. Process sewer flushing on a regular basis to prevent buildup of materials which can cause sudden pollution loading on the treatment plant, thereby causing treatment process upsets.

g. Collection vessels provided near units,with frequent checking, cleaning, or maintenance.

h. Specialized handling systems for process turnaround wastes (sludges, washwaters, cleanup, etc.).

II.A.4 Changes in Process Technology

The applicant must consider and describe technological changes which may occur subsequent to design and construction of new source.

Substitution of catlysts which have high activity and longer life, and hence require less regeneration (e.g., decoking with sparge steam) and involve lower wastewater production,should be specifically assessed for retrofitability/suitability.

Also, the following technological changes should be assessed:

a. Replacement of barometric condensers (direct-contact condensers) with surface condensers (indirect-contact condensers) or air-fin coolers.

b. Substitution of air-fin coolers to relieve various cooling water requirements within the process.

c. Installation of hydrocracking and hydrotreating processes to reduce sulfide and spent caustic loadings in the wastewaters.

d. Installation of automatic monitoring instrumentation (e.g., TOC monitors for early detection of various upset conditions).

e. Increased use of drying, sweetening and finishing procedures that will minimize spent caustics and acids, water washes, and filter solids requiring disposal.

II.A.5 Cooling Towers

Cooling systems should be described; the applicant should specifically discuss the suitability of non-evaporative cooling devices in the discussion. In general, such discussions should cover the following:

a. Evaporative Cooling Systems:

    (1) Spray ponds.
    (2) Mechanical-draft cooling towers.
    (3) Atmospheric cooling towers.
    (4) Natural-draft cooling towers.

b. Dry Cooling Systems: These units use heat-dissipating air-fins to reject unwanted heat directly to the air.

c. Wet-dry Systems:

II.A.6 In-process Pretreatment

Discussion of the following important pretreatment steps should be included in the EIA:

a. Neutralization of spent caustic wastewaters.

b. Separation of oil from ballast waters, slop oil recovery systems.

c. Clarifiers to separate sediments using chemical coagulants as necessary.

II.B End-of-Process Controls for Effluents

The applicant should provide a full description of the end-of-process treatment plant to be employed in the proposed new source. A treatment process flow diagram should be utilized to explain various treatment steps and to show quantitatively the mutual balance through the process. (See Chapter III, Section B.3 of the General Assessment Guideline.)

Specific attention should be given to the following treatment plant-related considerations:

1. Reliability.

2. Susceptibility to upset by natural storms, floods, etc.

3. Margin for process expansion.

4. Effluent monitoring systems.

5. Allowance for treatment plant expansion to meet increased discharge standards which may be instituted.

6. Capability of the treatment plant to process different kinds of wastewaters, whose composition will vary according to varying raw material, product mix parameters, etc.

7. Capability of the treatment plant to remove (or be upgraded to remove) trace substances which may be defined subsequently as toxic substances.

8. Complexity of operation and maintenance operations.

II.C Solid Waste Control Measure

II.C.1 Process Wastes

Methods by which all solid wastes will be recycled, reused, or disposed of must be identified for all solid wastes.

Using the waste identification and quantification developed in Section I of this appendix, the applicant should relate and evaluate the adequacy of planned disposal sites and state what long-term disposal measures be implemented if disposal system capacity is insufficient.

Particular attention should be paid to oily sludges and spent caustic wastes.

Open-pit disposal and volume reduction of oily sludge by open burning will generally be considered inadequate because of obvious atmospheric pollution effects.

Open-pit disposal of spent caustic streams has also been shown to cause leaching problems, with potential impact upon ground water.

The applicant should specifically analyze and assess the suitability of fluidized-bed incineration of these wastes as one disposal option.

Heavy metal or trace metal leaching problems should also be assessed.

II.C.2 Treatment Plant Sludges

The applicant should describe what sludge handling and disposal methods will be employed.

If landfilling is planned without any predigestion step, the applicant should describe how odor problems will be controlled. Leaching problems shall be assessed and also described in the EIA.

II.D Control of Air Emissions

The applicant must describe how hydrocarbons, particulates, and carbon monoxide, sulfur dioxide, smoke, and odors will be controlled.

Following are the specific measures which should be assessed as a minimum.[1]

1. Hydrocarbons

    a. Floating roof tanks.
    b. Manifolding purge lines to recovery system or flare.
    c. Use of vapor recovery systems on loading facilities.
    d. Good housekeeping.
    e. Covered waste treatment plant.
    f. Operation of a carbon monoxide boiler.
    g. Use of mechanical seals on pumps and compressors.
    h. Training of personnel.

2. Particulates

    a. High-efficiency mechanical separators.
    b. Electrostatic precipitators on catalyst regenerators, and/or power plant stacks.
    c. Controlled combustion(smokeless).
    d. Maintenance of correct stack temperature.
    e. Use of smokeless flames for burning gases.
    f. Use of improved incinerators.

3. Carbon monoxide

    a. Proper furnace and burner design.
    b. Carbon monoxide boiler on catalytic cracking and fluid coking units.

4. Odors

    a. Good housekeeping.
    b. Regulation of hydrocarbons and sulfur emissions.
    c. Treatment of sour water streams (produced in catalytic crackers, gas processing units, and vacuum towers).

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[1] Atmospheric Emissions from the Petroleum Refining Industry, U.S. EPA. EPA-650/2-73-017. NTIS No. PB 225-040.

5. Sulfur dioxide

   a. Desulfurization of fuels used in heaters and boilers.
   b. Flue gas desulfurization.
   c. Low-sulfur fuels.

6. Nitrogen oxides

   a. Combustion control unproven units.
   b. Stack dispersal.

III. OTHER DESIGN FACTORS WHICH CONTROL REFINERY IMPACTS

III.A Aesthetic Impact Control

The applicant should describe the following, as a minimum:

1. Site arrangement to obscure tall towers.
2. Directional lighting.
3. Greenbelts (which also attenuate noise).

III.B Dockside Terminal Impact Control

Description of the following control/prevention measures should be included, as applicable:

1. Studies to optimize dredging/dredge spoil disposal programs:

    a. Currents at the dredge site.
    b. Dredge spoil contaminants.
    c. Means for controlling spoil exposure to oxidants (thereby limiting contaminant release).
    d. Disposal site selection (migration susceptibility, unique fauna, fishing).
    e. Plan for dredge material disposal.
    f. Monitoring plan.

2. Oil-containment procedures:

    a. Booms around docked ships.
    b. Weather effect upon containment systems.

3. Pierside slop tanks.

4. System for collecting drainage from transfer pipelines.

III.C Pipeline Impact Control

The applicant should describe, as a minimum, the following control systems:

1. Remote maintenance valve operation.
2. Utility corridors around line.
3. Use of existing utility rights-of-way.
4. Leak-detection systems.
5. Cathodic protection.
6. Land control and stabilization.

IV. EVALUATION OF AVAILABLE ALTERNATIVES

IV.A Site Alternatives

Site alternatives for refineries encompass the following:

1. Refinery Processing Site Alternatives.
2. Tank Farm Alternatives.
3. Docksite Alternatives.
4. Pipeline/Transportation Alternatives.

Each of these categories will have a distinct environment of its own and, consequently, a distinct set of impacts.

The criteria in Chapter IV of the General Assessment Guideline should be used to determine whether an analysis of each of the foregoing refinery components is necessary. These criteria are based essentially on the presence of sensitive areas, the size of the proposed facility in relation to current facilities elsewhere in the U.S., and the reliability of the proposed operations. The responsible official should be consulted to assure that the appropriate alternatives have been considered.

IV.B Process Alternatives

Manufacturing alternatives will be determined by economic and marketing conditions. It is anticipated that new-source refineries to be proposed in the near future will be residual fuels (e.g., No. 6 fuel oil) refineries, i.e., essentially topping refineries with hydro-desulfurization to produce high-quality (low-pollution) fuels. Residual fuels, in recent years, have been the primary petroleum imports and are the petroleum products hardest hit by recent worldwide petroleum-producing policy changes. Also, the kind of crude oil available to the refiner will greatly affect the final process options. Production of any given petroleum product will entail significantly different processing technology if different crudes are used.

The new-source applicant should discuss concisely such process constraints in the EIA.

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APPENDIX B-3

ORGANIC CHEMICALS INDUSTRY

Introduction

This Appendix supplements, for the Organic Chemicals Industry, the instructions provided in the General Assessment Guideline. This applicant should discuss in the EIA all relevant impacts discussed in the following sections. The material in the EIA should be in the format described in the General Assessment Guideline.

I. IMPACT DESCRIPTION AND CONTROL

I.A Process Waste Impacts

All process wastes shall be identified by means of a suitable process flow diagram, and described both verbally and quantitatively.

The process flow diagrams should be sufficiently detailed to show the following:

1. Closely related process elements, such as raw water treatment, raw material and feedstock pretreatment, storage and handling, product storage and distribution.

2. All process water inputs and outputs.

3. All sources of leakage, spillage.

The applicant, using the provided process diagram(s), must moreover discuss how product mix will vary and explain the causes for such variation. The effects of product mix upon waste load quantities shall be explained in detail, with special emphasis given to describing process configurations associated with maximum and minimum waste generation levels.

The applicant shall, in all cases, assume worst-case conditions when evaluating process waste impacts.

A major requirement which the process flow diagram must fulfill is the illustration of individual processes which are integrated within the proposed organic chemical manufacturing facility. Interconnections which tie together various process inputs and outputs should be described explicitly.

1. All components requiring cleaning and washout.
2. All liquid, solid, and vapor recovery and/or recycle steps.

Organic chemical manufacturing complexes which are comprised of several or many individual chemical processes whall be described by both process specific diagrams and general flow diagrams for the complex.

Where production mix varies according to market demand, raw material availability, etc., and causes a significant change in waste loads, the applicant must discuss.

Feedstock and other raw material requirements must also be given special consideration in the EIA. Effects of feedstock variation or substitution upon process waste characteristics shall be specifically described.

Where more than one process option exists for manufacturing the same product, the applicant shall compare process waste loads and give justification for the process chosen.

As aid to explanation of complex integration of raw materials, precursor intermediate feedstocks and end-products, the applicant should supply "end-use" diagrams illustrating the many complex interactions typical to the proposed facility.

I.A.1 Effluents

Effluents should be described with particular attention to the following:

a. Periodic washing or steaming used to treat non-aqueous catalysts, working solvents, etc.

b. External washes, maintenance operations, area washdowns.

c. Method and degree of process wastewater segregation from non-process contact wastewaters, such as cooling water, recirculating steam, etc.

d. Intermittent discharges associated with startup, shutdown, or process upset situations.

e. Stormwater runoff.

f. Steam and cooling water blowdown.

All effluents should be described in terms of expected flow rates and waste loadings.

I.A.2 Solid Wastes

Solid wastes should be identified in terms of source, content, and generation rate.

In particular, the applicant's presentation shall include as a minimum consideration of the following solid waste sources:

1. Off-quality product.
2. Sludges from water and wastewater treatment systems (sediment, biological sludges, spent filter media, oil water separators).
3. Spent catalysts (normally recycleable).
4. Ash from incinerators and boiler houses.

5. Miscellaneous scrap from packaging, including metal strapping, and board, wood, etc.

6. Tar and other heavy residues.

7. Furnace coke.

8. Desiccants.

I.A.3 Air Emissions

Air emissions should be identified in terms of source, composition, and emission rate.

Air emissions for approximately thirty different organic chemical manufacturing processes have been surveyed and published by the EPA. (See Reference No. 1).

These surveys provide information regarding both source identification and control practices.

Processes which have been surveyed are summarized in Table B-3-1.

Among the sources which are found in organic chemical processes, generalized kinds of air emission sources appear frequently and are listed here to exemplify the scope of sources which must be considered.

a. Catalyst regenerator unit off gases or off-gas vents.
b. Light-ends scrubber vents.
c. Storage tank vents.
d. Absorber vents.
e. Combustion of fuel for reactor startup.
f. Organic waste boilers - flue gas and boiler off gas.
g. Furnace decoking, regeneration.
h. Steam exhaust of organics.
i. Drying, conveying, melting.
j. Emergency or startup vents.
k. Neutralization of spent caustic streams.

Fugitive emissions should also be identified and estimated. Design or control features should also be discussed.

The following emissions were identified for an ethylene manufacturing operation. These kinds of sources should be specifically discussed in the EIA.

Table B-3-1

Organic Chemical Manufacturing Processes Covered by Atmospheric Emissions Surveys
(See Reference No. 1)

Acetaldehyde via Ethylene
Acetaldehyde via Ethanol
Acetic Acid via Methanol
Acetic Acid via Butane
Acetic Acid via Acetaldehyde
Acetic Anhydride
Adipic Acid
Adiponitrile via Butadiene
Adiponitrile via Adipic Acid
Carbon Disulfide
Cyclohexanone
Dimethyl Terephthalate (and TPA)
Ethylene
Ethylene Dichloride (Direct)
Formaldehyde (Silver Catalyst)
Glycerol (Allyl Chloride)
Hydrogen Cyanide (Andrussow)
Isocyanates via Amine Phosgenation
Maleic Anhydride
Nylon 6
Nylon 6, 6
Oxo-Process
Phenol
High-Density Polyethylene
Low-Density Polyethylene
Polypropylene
Polystyrene
Polyvinyl Chloride
Styrene
Styrene-Butadiene Rubber
Vinyl Acetate via Acetylene
Vinyl Acetate via Ethylene
Vinyl Chloride via EDC Pyrolysis

The following flue gas ventings result from furnace shutdowns:

a. Vapors from oil water separators.
b. Vapors from decant water.
c. Tight oil-storage drums.
d. Heavy oil vapors from processing, storage, loading.
e. Control gas vent from flue stack (pneumatic instruments operated by flue gas).
f. Pump seal and packaging leakage.
g. Vapors from engine crankcases and compresser oil reservoirs.
h. Container surging and filling.
i. Vents from moisture analyzers and vents.
j. Vapors from oil drainage for maintenance.
k. Valve-stem packing leaks.
l. Flange leaks.
m. Compressor seal leaks.

I.B Other Impact Sources

I.B.1 Raw Materials Development-Related Impacts

New Organic Chemicals Processing complexes will place increased demands upon raw material supplies.

Such demand will incrementally influence crude oil and natural gas exploration and importation, which will in themselves ultimately affect the environment. Such induced impacts should be examined by the applicant in a cursory fashion; detailed impact analysis of such resource development policy will ultimately be addressed by other Federal agencies.

I.B.2 Transportation and Handling

An integral part of any Organics complex will be the handling and transportation of feedstock and finished products, which cause significant impacts, examples of which are the following:

a. Tanker spills and accidents (dockside spills associated with transfer operations).

b. Pipeline construction between loading, unloading areas, and the process unit, resulting in land clearing, interference with traffic, and other transportation potential pipeline fractures or leaks.

The applicant must examine such impact sources in the EIA.

I.B.3 Site Preparation and Facility Construction

The applicant should discuss in the EIA all site preparation and facility construction operations which involve direct environmental impacts. Odor, noise, and aesthetic impact reduction will require the following special site development considerations, which should also be considered in the EIA:

a. Location of high noise-producing units as nearly as possible in the site interior (high-noise units are generally those using steam jets for vacuum production).

b. Use of a green-belt to attenuate noise and aesthetic impacts.

Another specialized site development problem is the location and arrangement of storage tank farms, which require special dike systems (to collect spills). Such tank farms require large tracts of land, which must be cleared and graded. Care should be taken to minimize the amount of prime land which is developed for this purpose.

II. IMPACT CONTROL

II.A Effluent Controls

II.A.1 In-process Controls

The applicant should discuss all in-process controls which will be incorporated in the new source.

Such discussion should cover, but not be limited to the following:

a. Substitution of barometric condensers with surface heat exchangers.

b. Maximization of recirculating steam and cooling water systems.

c. Substitution of vacuum pumps for steam jet ejectors.

d. Recycle of scrubber water.

e. Separation and recovery of insoluble hydrocarbons.

f. Phenol removal through solvent extraction, steam stripping, chlorination.

g. Ammonia and sulfide stripping.

h. Cyanide removal via chlorination.

i. Ozonation.

j. Incineration of chlorinated hydrocarbons.

k. Incineration of spent caustic wastewaters and oily sludges.

II.A.2 End-of-process Effluent Controls

The applicant should describe all end-of-process effluent controls. Using a treatment plant flow diagram as basis for explanation, all plant design criteria shall be stated, and removal efficiencies for each treatment plant section defined.

Particular attention should be paid to describing process reliability, flexibility to handle highly-variable waste streams resulting from changes in feedstock or product mix, redundancy, and the ability to meet process expansions and increased effluent removal requirements.

II.B Solid Waste Controls

II.B.1 Hazardous Waste Control

A wide variety of organic wastes produced by the organic chemical manufacturing industry have been described as hazardous wastes by the EPA Office of Solid Waste Management. Resource conducted by EPA has been directed at the following:

a. Information base development.
b. Waste management practice analysis
c. Determination of hazardous waste forms and quantities.
d. Research and development planning.

Table B-3-2 presents a listing of hazardous organic compounds which have been investigated.

Waste management practices, both current and recommended, have been specified for each of these organic compounds, relating particularly to the applicability of recovery and recycle, incineration, biodegradation, and landfill disposal. Landfill disposal options have been categorized in the following three major groups:

a. Municipal landfills.
b. Industrial landfills.
c. National hazardous-materials disposal sites.

All compounds which will be manufactured, stored, handled, processed, or wasted as part of the proposed new source facility, and which are included in the hazardous substance listing (Table B-3-2), should be specifically described by the applicant in the EIA. Handling and disposal practices which reflect EPA findings and recommendations shall also be described.

II.B.2 Other Solid Waste Disposal

Hazardous materials classification and differentiation from ordinary solid waste materials has been based upon the following criteria:

a. Quantity produced.
b. Material distribution.
c. Toxic hazard to man and environment.
d. Explosiveness, flammability, and other hazards.

Solid wastes which comprise part of the preceding hazardous materials classification should be treated as hazardous substances by the applicant.

Furthermore, the applicant shall be responsible for interpreting and extending the hazardous materials designation criteria for the set of wastes which will be encountered in the proposed new source facility.

Table B-3-2

Hazardous Organic Compounds

1. Acetaldehyde
2. Acetone
3. Butyraldehyde
4. Camphor
5. Crotonaldehyde
6. Cyclohexanone
7. Diisobutyl Ketone
8. Ethyl Methyl Ketone
9. Furfural
10. Isophorone
11. Mesityl Oxide
12. Methyl Isobutyl Ketone
13. Paraformaldehyde
14. Propionaldehyde
15. Acetic Acid
16. Acetic Anhydride
17. Acetyl Chloride
18. Formaldehyde
19. Oleic Acid
20. Phthalic Anhydride
21. Sodium Formate
22. Sodium Oxalate
23. Acetone Cyanohydrin
24. Acetonitrile
25. Acrylonitrile
26. Cyanoacetic Acid
27. Ethylene Cyanohydrin
28. Toluene Diisocyanate
29. Acetylene
30. Butadiene
31. Butane
32. 1-Butene
33. Butylene
34. Cyclohexane
35. Dicyclopentadiene
36. Diisobutylene
37. Ethane
38. Ethylene
39. n-Heptane
40. 1-Heptene
41. Hexane
42. Isopentane
43. Isoprene
44. Naphtha (crude)
45. n-Pentane
46. Propane
47. Propylene
48. Tetrapropylene
49. Tripropane (Norene)
50. Turpentine
51. Anthracene
52. Benzene
53. Creosote (coal tar)
54. Cumene
55. Dodecylbenzene
56. Ethylbenzene
57. Naphthalene
58. Styrene
59. Styrene Polymers
60. Toluene
61. Xylene
62. Acrylic Acid
63. Adipic Acid
64. Benzoic Acid
65. Fatty Acids
66. Formic Acid
67. Propionic Acid
68. Salicylic Acid
69. Allyl Alcohol
70. Amyl Alcohol
71. Butanols
72. Cyclohexanol
73. Decyl Alcohol
74. Diethylene Glycol
75. Furfural Alcohol
76. Glycerol
77. Isopropanol
78. Methanol
79. Methyl Amyl Alcohol
80. Octyl Alcohol

Table B-3-2
(continued)

81. n-Propyl Alcohol
82. Propylene Glycol
83. Sorbitol
84. Triethylene Glycol
85. Allyl Chloride
86. Aminoethylethanol Amine
87. n-Butylamine
88. Cyclohexylamine
89. Diethanolamine
90. Diethylamine
91. Diethylene Trimine
92. Diisopropanolamine
93. Dimethylamine
94. Ethanolamine (Monoethanolamine)
95. Ethylamine (Monoethylamine)
96. Ethlyene Diamine
97. Hexamethylene Diamine
98. Isopropyl Amine
99. Methylamine
100. Morpholine
101. Propylamine
102. Triethanolamine
103. Triethylamine
104. Triethylene Tetramine
105. Trimethylamine
106. Urea
107. Amyl Acetate
108. Butyl Acetate
109. Butyl Acrylate
110. Di-n-butyl Phthalate
111. Ethyl Acetate
112. Ethyl Acrylate
113. Ethyl Phthalate
114. Isobutyl Acetate
115. Methyl Acetate
116. Methyl Acrylate
117. Methyl Formate
118. Methyl Methacrylate
119. n-Propyl Acetate
120. Vinyl Acetate
121. Acridine
122. Aniline
123. 2,4-Dinitroaniline
124. m-Methylaniline
125. B-Naphthylamine
126. Phenylhydrazine Hydrochloride
127. Pyridine
128. o-Toluidine
129. Benzene Sulfonic Acid
130. Benzyl Chloride
131. o-Butyl Phenol
132. p-Butyl Phenol
133. Carbolic Acids (Phenol)
134. Cresol (Cresylic Acid)
135. Diethylstilbestrol
136. Ethyl Phenol
137. Nonyl Phenol
138. Xylenol
139. Butyl Mercaptan
140. Carbon Disulfide
141. Carbon Tetrachloride
142. Chloral Hydrate
143. Chloroform
144. Dichloroethyl Ether
145. Dichlorofluoromethane
146. Dichloromethane
147. 1,2-Dichloropropane
148. 1,3-Dichloropropene
149. Dichlorotetrafluoroethane
150. Epichlorohydrin
151. Ethyl Chloride
152. Ethylene Dichloride
153. Methyl Chloroformate
154. Perchloroethylene
155. Polyvinyl Chloride
156. Tetrachloroethane
157. Trichloroethane
158. Trichlorofluoromethane
159. Vinyl Chloride
160. Chlorobenzene (Chlorobenzol)

Table B-3-2
(continued)

161. o-Dichlorobenzene
162. p-Dichlorobenzene
163. Hexachlorophene
164. Trichlorobenzene
165. Benzoyl Peroxide
166. 1,2,4-Butanetrioyl Trinitrate (BTTN)
167. Chloropicrin
168. Cyanuric Triazide
169. Diethylether
170. Dioxane
171. Ethers
172. Ethylene Glycol Monoethyl Ether
173. Ethylene Glycol Monoethyl Ether Acetate
174. Isopropyl Ether
175. Polypropylene Glycol Methyl Ether
176. Propylene Oxide
177. Tetrahydrofuran
178. Dinitrobenzene
179. Dinitrophenol
180. Diphenylamine
181. Ethylene Bromide
182. Methyl Bromide
183. Methyl Chloride
184. Ethyleneimine
185. Glycerol Monolactate Trinitrate (GLNT)
186. Hydrazine Azide/Hydrazine
187. Hydroquinone
188. Maleic Anhydride
189. Manganese Methylcyclopentadienyltricarbonyl
190. Nitroaniline
191. Nitrobenzene
192. m- and p-Nitrochlorobenzene
193. Nitroethane
194. Nitromethane
195. 1-Nitropropane
196. 4-Nitrophenol
197. 4-Nitrotoluene
198. Oxalic Acid
199. Phosgene (Carbonyl Chloride)
200. Polychlorinated Biphenyls
201. Polyvinyl Nitrate (PVN)
202. Quinone
203. Tetraethyl- and Tetramethyllead
204. Tetranitromethane
205. Tricresyl Phosphate
206. Acrolein
207. Diemthyl Sulfate
208. Pentachlorophenol

Consequently, solid waste management practices recommended by the applicant should strongly parallel those recommended for hazardous materials. Exceptions should be specifically stated and described in detail.

II.C Air Emission Controls

Using a process flow diagram, the applicant must designate all emission control and recovery devices which will be incorporated.

Each stack or vent should be designated and described with regard to function, emission factors, and controls.

Although emission control and recovery systems will vary for each process, the applicant should specifically evaluate the following control systems as part of the EIA:

(1) Off-air scrubbers (for reactor surges).
(2) Light-end scrubbers (for crude stills, product storage tanks)
(3) Absorbers.
(4) Incinerators.
(5) Flares.
(6) Venturi scrubbers.
(7) Cyclones.
(8) Bag filters.
(9) Condensers.
(10) Knock-out drums, degassers, demisters.
(11) Process feedstock substitution.
(12) Process technology change.

III. Alternatives

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of alternatives analysis. The responsible official should also be consulted to assure that there is no difference of opinion on the scope.

III.A Site Alternatives

The applicant should state and discuss the site selection criteria for the new organic chemicals complex. Trends towards integration of organic chemicals processing with basic petroleum refining because of economic advantages would exemplify one such criterion.

Alternative site locations for dock facilities, pipelines, storage facilities, and waste treatment facilities are, however, more variable and should be examined with a level of detail which is commensurate with the magnitude of the new complex.

III.B Process Alternatives

Sometimes, different processes may be used to produce the same end product in the Organic Chemicals Industry. The applicant should state what constraints have affected choice of process.

It is recognized that in new organic chemicals complexes, a potentially greater flexibility exists to use inherently clean processes. The applicant should describe what steps have been taken to optimize process selection and overall process integration to minimize pollution loads, accounting specifically for flexibility required to meet changing market demands.

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7. Air Pollution from Fuel Combustion in Stationary Sources. (NTIS No. PB-222-341/0) EPA-R2-73-241.

8. Air Pollution from Chlorination Processes. (NTIS No. PB-218-048/7).

9. Hydrocarbon Losses from Valves and Flanges. (NTIS No. PB-216-682).

10. Hydrocarbon Leakage from Pressure Relief Valves. (NTIS No. PB-216-715)

11. Fluidized-Bed Incineration of Selected Carbonaceous Industrial Wastes. (NTIS No. PB-211-161).

12. Control Techniques for Hydrocarbon and Organic Solvent Emissions from Stationary Sources. (NTIS No. PB-190-266).

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APPENDIX B-4

STEAM SUPPLY AND NON-CONTACT COOLING WATER INDUSTRIES

Introduction

This Appendix supplements, for the Steam Supply and Non-Contact Cooling Water Industries, the instructions provided in the General Assessment Guideline. The applicant should discuss in the EIA all relevant impacts discussed in the sections which follow. The material in the EIA should be in the format described in the General Assessment Guideline.

The Steam Supply and Non-Contact Cooling Water Industries include all enterprises engaged in the production or distribution of steam, heated or cooled air, and non-contact cooling water. "Non-contact" refers to the inherent segregation of process streams and coolant streams which typifies certain cooling-water systems.

This Appendix is limited only to these industries and should not be confused with Steam and Electric Generation Industries (Power Utilities).

I. IMPACT IDENTIFICATION

I.A Process Waste Impacts

All process wastes shall be identified by means of a suitable process flow diagram which designates each waste source. Waste sources should be described verbally and quantitatively according to the guidance contained in the following sections.

I.A.1 Effluents

Effluents should be described for both continuous and intermittent sources, and fully characterized in terms of important pollutant parameters.[1]

Special attention shall be paid to the use of chemical additives for prevention of scale, corrosion, carryover, slime growth, rotting, etc. Use of such chemicals shall be related to other process requirements, with explanation being given of how such variables were interrelated, to reduce final wastewater pollutant loads or impacts. Chromium-bearing chemicals, for example, are of special concern since chromium in the hexavalent state is toxic to aquatic organisms.

Estimates of special cleaning and flushing operations, and description of how resultant wastewaters will be handled, should likewise be made.

Effluents from flue gas scrubbers, raw water treatment plants, fly ashponds, system blowdowns, and coal storage areas, must also be covered in the EIA.

Special attention must be paid to metal contaminants which may appear in wastewaters as a result of ash handling operations, flue gas scrubbing, etc. Mercury and other trace metals may be present depending upon the coal being used. The applicant must explain and justify fuel source, handling, and treatment methods which will be incorporated in the new source if heavy metals are likely to be present.

Thermal characteristics of effluents must also be fully described for significant effluents such as once-through cooling water, boiler blowdowns, etc.

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[1] Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Steam Supply and Non-Contact Cooling Water Industry. U.S. EPA 1975.

I.A.2 Solid Waste Impacts

Solid wastes should be identified, estimated, and described.

Of particular concern will be the following:

a. Solid wastes associated with bottom and fly ash handling systems.

b. Solid wastes associated with water treatment systems.

c. Solid wastes generated during maintenance operations.

Particular attention should be given to discussing the effect of air pollution controls upon solid waste characteristics and quantities. Evaluation should be made for example, of low-sulfur fuel availability and use in cases where SO_2 controls would otherwise necessitate wet-scrubbing systems.

Ash handling, reuse, or recovery for cement manufacturing, etc. should also be discussed. Where aqueous sluicing systems are employed for handling bottom or fly ash, consideration must be made of potential leaching problems resulting at the ash pond site. Such assessment of leaching should include full consideration of site geology and hydrogeology and possible leachate control measures (e.g. lining, PH control, etc.).

I.A.3 Air Emissions

All air emissions must be identified and quantified.

I.A.3.a Fuel Combustion

The applicant's description should cover, as a minimum, the type of fuel and fuel grades available, standby fuel combustion equipment, soot blowing, and related operating practices and schedules.

Sulfur oxides, nitrogen oxides, particulates, hydrocarbons, and carbon monoxide levels must be estimated.

I.A.3.b Cooling Tower Plumes

Cooling towers should be described and evaluated with respect to fogging and potential impacts upon roads and air traffic.

In addition, the applicant should describe any impacts resulting from carryover of cooling water (spray and drift) upon the local environment. This potential impact will be especially important where the coolant contains high levels of dissolved solids.

I.B Other Impacts

The applicant should identify and review with the responsible official all processes, manufacturing operations, or other activities associated with the proposed new source steam or non-contact cooling water facilities. This review should clarify the degree to which impacts resulting from these dependent activities must be considered in the applicant's EIA. Where major manufacturing or processing activities will be serviced, the applicant will be required to examine comprehensively all associated impacts. If specific appendices which cover the serviced operations have not been developed, the applicant should use the General Assessment Guideline, in conjunction with the responsible official, to determine the EIA requirements.

II. ALTERNATIVES

The criteria in Chapter IV of the General Assessment Guideline should be used to determine the scope of alternatives analysis. The responsible official should also be consulted to assure that there is no difference of opinion on the scope.

II.A Site Alternatives

Site selection for proposed new source steam supply or non-contact cooling water actions may generally be performed on the basis of economic impacts, since both industries are largely captive; that is, only usable where industry already exists.

Some care in siting cooling towers should be taken in order that fogging or icing of roadways, airways, etc., is avoided.

II.B Process Alternatives

Major process alternatives exist for non-contact cooling systems with respect to the kind of cooling devices used. Generally, recirculating, closed-loop systems are the most environmentally acceptable since they dissipate their heat to air media which are relatively insensitive biologically; and they are more conservative in water use. Blowdowns necessitated by such cooling systems generally have a low impact. Many kinds of closed-loop (recirculating) systems exist; the EIA need not explore all such design options in detail, but rather, indicate the basic assumptions and design requirements affecting final system design.

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